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Lime Production Methods of Europe and America

Part XI—Application of Natural Gas to Vertical and Rotary Lime Kilns

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NO FUEL approaches the ideal as closely as natural gas and our country, as owner of tremendous quantities, may consider itself fortunate indeed. Pipe lines in a continually expanding network now deliver gas in regions where the general public previously hardly knew that there was such a fuel. Today, in a single instance, natural gas is sent 1000 miles in quantities of several hundred million cubic feet a day, a quantity equal to some 15,000 tons of coal, a string not of coal cars but coal trains and this is only one pipe line, with many others in existence and still others in contemplation.

With natural gas passing through lime manufacturing regions the producers of lime and distributors of gas developed a joint interest in its application and its use was attempted here and there, not always successfully, however, because knowledge of its proper application was lacking. There were plants where natural gas was a complete success, largely because they were located close to its source where it was cheap, while at long distances where it was expensive, and crudely applied it was a failure.

When used in a way that fails to bring forth its advantages natural gas will prove too costly unless it can be purchased cheaply. For best results the kilns, as well as the operating system, should be adapted to it and the whole should be arranged to derive the benefits inherent in gas. The writer has had experience in plants where natural gas is used with success today and in other plants where its use was abandoned, and in addition, in 1930, he visited Transylvania-Roumania in Europe where natural gas has been used for the burning of lime for some 25 years.

Editors' Note

IN THE present article of this series the author discusses the many advantages of natural gas as a fuel in the calcination of limestones.

Various methods of applying this fuel to vertical and rotary kilns and some of the advantages and disadvantages of each are described and a summary given of the important and desirable factors.—The Editors.

In earlier articles of this series the advantages of mixed feed kilns were shown; in this, natural gas will have its inning, to be followed by producer gas. Whatever we say about natural gas should not be taken as a condemnation of producer gas or of any other fuel. Each has its proper place, which can be determined by a careful weighing of advantages and disadvantages. It is not all a matter of first cost or even final cost. One must go even further and consider the quality of the product, especially in cases where quality is important. Often the advantages are so concealed that they become apparent only after a considerable period. At times they are so concealed as not to be noticed at all. Results are sometimes weighed on too coarse a scale. Influences affecting results are crudely analyzed, faulty conclusions are formed and some of the influences, due to either limited experience or limited technical knowledge, are not even perceived.

Natural gas, stripped of natural gasoline, is as a rule mainly methane, a hydrocarbon gas. Smaller quantities of other hydrocarbons, as ethane and occasionally under certain conditions propane and possibly a small quantity of butane, together with some inert gases such as nitrogen and in some cases helium, are also present. In addition, there are supplies of exceptional natural gases; for example, some consisting almost entirely of carbon dioxide, but we are not concerned with them. All that we need to consider are those of more regular characteristics, the analyses of some of which are given in the following tabulation:

NATURAL GAS ANALYSES

	Monroe, La.	Columbus, Ohio	Kansas City, Mo.	Transylvania
Methane	94.7	80.4	84.1	99.1
Ethane	2.8	18.1	5.7	.....
Nitrogen	2.3	1.5	8.4	.9
Carbon dioxide	.2	.....	.8	.....
B.t.u./cu. ft.	1004	1132	949	.....

Methane is predominant and determines the characteristics of the gas. The higher hydrocarbons such as ethane, propane, butane and particularly illuminants would be more desirable but are not present in any great quantities. Methane, however, is a fuel of very valuable characteristics.

If it were simply a matter of replacement of heat in natural gas for heat in coal on an equal basis without any special advantages favoring natural gas over coal, then natural gas would have its difficulties in competing with coal. A ton of 12,000 B.t.u. coal contains 24,000,000 B.t.u. and may cost $4. The volume of natural gas of 1000 B.t.u. per cubic foot required to equal this ton of coal would be 24,000 cu. ft. and gas to equal coal would have to sell for 16.6 c. a thousand cu. ft. In fact, if lower and higher heat values of coal and gas are considered it would have

to be even less, or about 15½ c. If such a simple exchange only applied there would be little reason for writing this article, but there is far more to it, much more to be taken into consideration, almost all of it favorable to natural gas.

To make the whole more interesting, it may be well to compare the advantages of natural gas with, say, producer gas firing. In doing this, the writer will run the risk of appearing partial to natural gas. It may even appear that he favors gas in all cases, but that is not the case. There are many instances where natural gas is so costly that its use, in spite of all its advantages, is not justified. The whole problem is rather complex, many things must be considered and carefully weighed and conclusions holding in one case seldom can be applied to another. Even in a given region where natural gas may be impractical in one plant, that does not mean that its use is not economically sound in the neighboring plant.

Natural gas is clean and can be delivered through any size line anywhere, differing from producer gas which contains ash, tar and coke and forms a deposit in the lines so that they have to be rather large and even then have to be cleaned often.

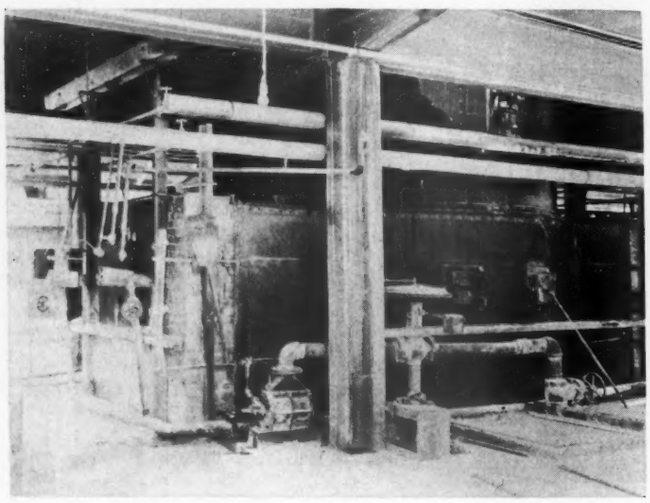


Fig. 146. Simple application of natural gas to kiln previously fired with oil

When natural gas is used there is no delivering and unloading of coal, and no coal handling equipment is needed. The pipe lines deliver the gas to the points of consumption. The cost of handling other fuels, necessary equipment for such handling, its high depreciation and repairs, is one of the things to be chalked up in favor of natural gas. Of course, if the plant already has all necessary coal handling equipment, the gain is not as great, but even then all of the labor and most of the wear is eliminated.

Firing with natural gas is very simple. One man can take care of many kilns and there is nothing to do but keep the burner adjusted, which is far simpler and more positive than the adjustment of producer gas burners. The labor of firing is reduced to a minimum. If the plant is equipped with a gas producer, the producer and ash men become unnecessary. If the plant is hand-fired, the only labor needed is for drawing. If drawing of the lime is simple, two men per shift are ample for 100 tons of lime per day if the kilns are not too small.

With natural gas there is no ash to remove, no furnaces to clean and no clinker to break in gas producers. The cleaning of furnaces on direct-fired kilns is extremely wasteful due to the cooling of the kiln charge. With natural gas the only interruption is due to the punching of the kiln which can in most cases be greatly simplified. If the plant is producer-equipped the blowing of flues becomes unnecessary, which also saves cooling the kilns, as in most plants there is almost a complete shut-down when the gas flues are being blown.

With natural gas there is no steam, no water and no electric current necessary. The usual steam boiler could, in the simpler plants, be shut down altogether, as no steam is required under the grates of a direct-fired kiln or under the ash bed of a gas producer or for atomizing oil when the kiln is oil fired. No water is needed as in the case of gas producers to cool the stirring bars or feeder or at times the producer top. Electricity also is not needed except for special purposes as when the kiln is to be forced or when gas is to be recirculated to cool the hot zone for conditioning of lime characteristics.

Producer gas firing is conducive to more uniform conditions than hand firing, but even producer firing is un-uniform compared with natural gas firing. Natural gas can be controlled precisely, as the adjustment will not change. Exactly the same amount of gas will flow through a burner and the proper amount of air can be apportioned. With gas producers, the bed resistance varies and slight differences in blowing, as well as soot accumulations, will change the amount of producer gas generated at any particular moment. Changing the burner on one producer gas fired kiln will affect all other settings. The whole, while infinitely better than hand firing, cannot be controlled as with natural gas and uniformity is exceedingly important. It is not the amount of gas that enters the kiln that counts, but rather the amount of heat generated and the most heat is generated when the gas gets the exact amount of air necessary. In direct fired kilns the air supply may within a half hour fluctuate from 20% too little to 50% or more too much. With producer gas this will not be so bad, but with natural gas the setting can be exact which will change only if the kiln draft changes.

Also, the gas quality is regular and exactly the same day after day, while with direct firing the volatile gases distill into the kiln from the freshy fired coal one minute, while a few minutes later it will be mostly all carbon monoxide from the coke remaining on the grate. Even in producer practice the gas may fluctuate from 5 to 10%, CO_2 and with carbon monoxide up and down. The gas at one time may have more hydrogen from steam blown into the producer and less residue steam, while next due to the change in the bed there may be more steam and less hydrogen, so it appears that only the quality of natural gas can always be depended upon.

Then, as natural gas is almost entirely carbon and hydrogen, neither of which affect the lime, with no more than possible traces of sulphur, there is little chance for lime contamination and a superior product must be the result. Also, with gas quality and supply constant, more uniform kiln temperatures are possible, resulting in a more uniform and for some purposes a superior product. The color also should be better with no ash and no tar to affect the lime.

A natural gas fired kiln plant is very simple and so is simple to supervise and much simpler to operate right. The more complex the plant, the more of it there is to supervise and the less likely it is to be operated right. The plant also is much cleaner, inclining one to take greater pride in it and consequently giving it greater care with better results.

From all of this we see that natural gas has many advantages which should be utilized if possible. However, if the higher possible efficiency, lower possible fuel costs, lower investment charges, better product, etc., are not taken advantage of, then natural gas use may not be so profitable. If these advantages are secured but the price charged for gas is too high, then coal may as well be used.

Of course, natural gas heat will never be obtained as cheaply as coal heat. It will always be at a premium, which is only right and if used wastefully, i.e., with its advantages unrealized, just will not pay. If 8000 cu. ft. of natural gas at a rate of 18 c. is used per ton of lime, as is the case in a certain plant, and coal is cheap, then natural gas is practical, but 8000 cu. ft. at 1000 B.t.u. indicates a kiln efficiency of only 34.5%, which is low and means a wasteful use of gas.

With the right combination and right kilns, properly operated, a premium can well be paid for heat in such convenient form as natural gas. If the kilns are wrong, as for example with shallow coolers, all air will have to enter with the gas and the heat in

the gas rather than the heat stored in the lime will be used to preheat the air up to kiln temperature. Expensive heat will be used rather than heat that costs nothing and the result will be high gas consumption. Of course, high coolers are important with any mode of lime burning in vertical shafts, but more important with natural gas.

Fig. 146 is a photograph of a simple application of natural gas to an existing kiln which was previously fired with oil. The gas line comes up through the floor at the right, the gas first passing through a shut-off valve, followed by a pressure regulating valve, then a meter, at which point it splits into two lines, one going to the furnace as shown equipped with two burners. These burners might better be called air-gas mixers, as the burning of the gas actually takes place in part in the furnace and in part in the kiln. With this arrangement, the gas quantity can be regulated with great exactness either by regulating the pressure or approximately by using either one, two or three sets of orifices in the burners. Primary air, that is air entering through the burners, can also be regulated and even entirely shut off. There is very little control over secondary air, however, with this system. The whole is shown in diagrammatic form in Fig. 147. It is a simple and practical installation, although not of high efficiency.

In Ohio, natural gas has been used to some extent and in one plant is still being used. Fig. 148 shows one arrangement which has been abandoned. The kilns were small, the coolers very shallow, and practically all the air for combustion entered with the gas, the mixture of air and gas discharging into the fire boxes. Here pre-combustion took place and the gases reached the kiln proper very hot. Combustion continued here, but as the already burned lime was incapable of absorbing more heat, an accumulation resulted causing still higher temperature and overburning of the lime. Since the hydrate was to have plastic properties, overburning was not permissible and, therefore, to reduce the high temperatures steam was admixed with the air. The result was that instead of simplifying the plant there was greater complication, as well as a reduction of kiln efficiency. Without steam 4000 to 4500 cu. ft. of gas were used per ton of lime, with steam about 5000 cu. ft., and in addition further fuel had to be used at the boiler to make the steam. There was both inefficient generation of heat and inefficient abstraction of it in the kiln.

Another method than the use of steam was also tried to keep the kiln temperatures down. This was based on re-circulation of some of the kiln gas to spread the heat in the hot zone over a larger space and thus lower temperatures. The trials were, however, very crude and nothing of any value was accomplished. The principle, however, is entirely sound if properly worked out. Fig. 149 shows the approximately correct system for this plant. The gases were drawn off while still quite hot, immediately mixed with air and admitted with natural gas through suitable burners into the fire boxes of the kiln. In this way, while the amount of heat generated in the hot zone is the same, the amount of gas flow is considerably increased and temperature is lowered. Heat transfer rate due to higher velocity is increased under these conditions, the heat is better distributed and the very hot zones and the cool zones in the kiln are averaged out, thus reducing the tendency for unequal upward flow of the gases, which condition is so common and so undesirable.

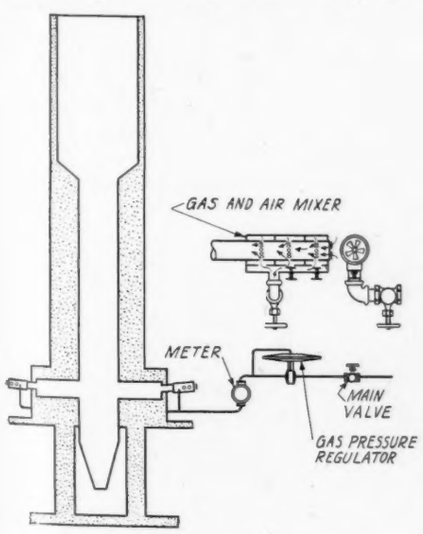


Fig. 147. Natural gas application to Texas lime kiln

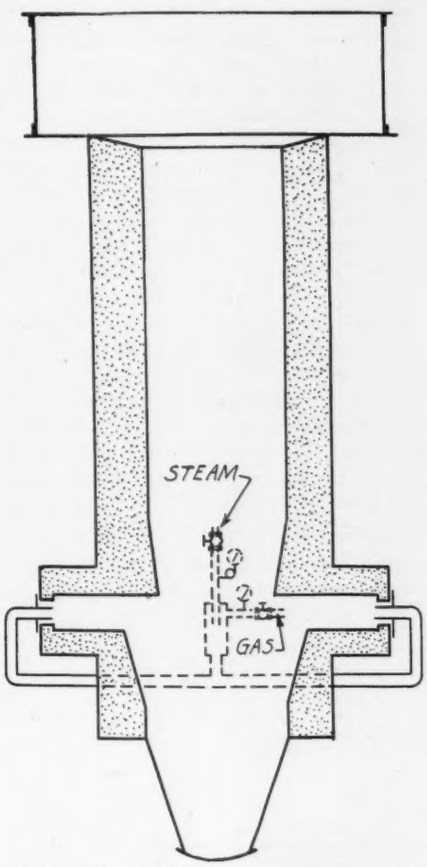


Fig. 148. Use of steam with natural gas to temper flame in Ohio kiln

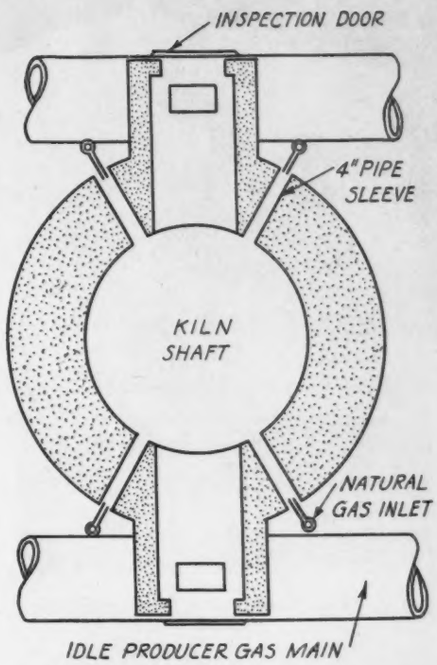


Fig. 150. Application of natural gas to kiln previously fired with producer gas

When steam is used, heat is wasted. There is a double loss, in fact; that necessary to generate the steam and that of heat which the steam carries out of the calcining into the preheating zone. With the system shown in Fig. 149 this is not the case, and although dilution takes place and temperatures are lowered, there is no heat loss. This is because whatever heat is withdrawn from the kiln middle is injected back at the burner, provided none was lost by radiation. Any such radiation loss can be reduced by insulation of ducts and by immediate mixture with air as shown.

There are different ways of regulating kiln temperatures. Steam is one way, and a more wasteful system is spraying water into the furnace. Recirculation of gases is a good way, and one can also resort to "retarded combustion" or "delayed combustion," which means generating heat more slowly so a considerable amount will be taken up by the lime before all of the gas is burned. This means permitting gas to enter the kiln direct without passing through the firebox, where precombustion takes place; all of the heat is then generated within the kiln. Fig. 150 shows how natural gas has been applied at another Ohio plant. No steam nor re-circulated gas is used in this plant. Although finishing lime is not made, the writer does not see why it could not be made if the kilns were drawn properly and often enough.

It is interesting to note that in the Texas

Fig. 151. Roumanian kilns without coolers

kilns mentioned practically 8000 cu. ft. of 1000-B.t.u. gas was required for the burning of one ton of high calcium lime, while in Ohio with gas of about 1050 B.t.u. per cu. ft. only between 4500 to 5000 cu. ft. is needed. The Ohio kilns are in no way more efficient than the Texas kilns, but it just shows the much lower heat requirements for calcining magnesian stone. One may say that magnesium carbonate is burned with heat leaving the zone where calcium carbonate is converted to oxide with heat that, in a high calcium kiln, would eventually be wasted. Magnesium carbonate requires less heat and has a lower calcining temperature. The fact that it requires less heat in itself is not so important. The lower calcining temperature, however, is very important. Natural gas kilns appear to bring out this contrast because they are not subject to such extreme abuse as kilns fired by hand, eliminating other influences caused by variability, such as extremely high excess air or incomplete combustion.

The Texas and Ohio kilns have short coolers, and with such coolers high efficiency is not possible, no matter what the fuel is and no matter how high the kiln is above the firing zone. It may seem queer, but the space below is more important within limits than the space above. To emphasize this, the writer can mention a natural gas kiln found in Roumania, that for high calcium lime required 10,000 cu. ft. of gas per ton. These kilns, producing about 15 tons each, are shown in Fig. 151 and their efficiency is low. In Fig. 152 we note the reason for the low efficiency. The gas is admitted through center burners, which is interesting and a valuable lesson; however, the point of admission is so low that the kiln has no cooler and there is no preheating of the air. However, even from this poor kiln one can learn, as with the gas coming in away from the walls the kiln life should certainly be lengthened and the distribution of heat bettered. However, one good point does not offset several poor ones, and this kiln is a poor one to copy for the burning of natural gas.

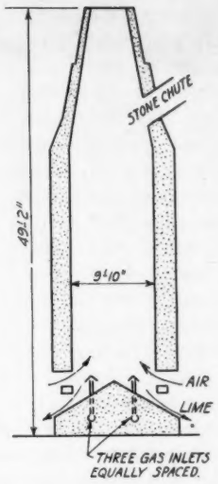


Fig. 152. Section of Roumanian kiln shown opposite

The kiln shown in Fig. 153 is another Roumanian kiln and, in contrast to the previous one, was most efficient. Gas consumption for high calcium lime was only about 4000 cu. ft., half that of the Texas kiln. The kiln is interesting because it had a positive way to use air from the cooler, as shown in the sketch. Gas was admitted at a pressure of several pounds to an injector nozzle which created suction and drew air from the cooler. As the air was extremely hot and as an injector created very intimate mixtures of the two gases, combustion at the kiln inlet must have taken place with explosive rapidity. The result was temperatures of 3000 deg. F., which no ordinary refractory such

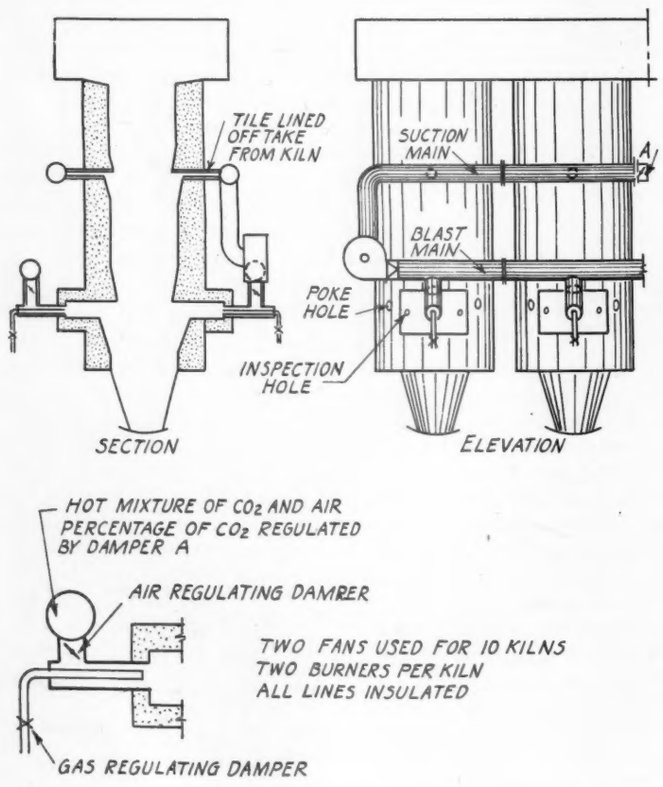


Fig. 149. Hot kiln gases used for mixing with natural gas

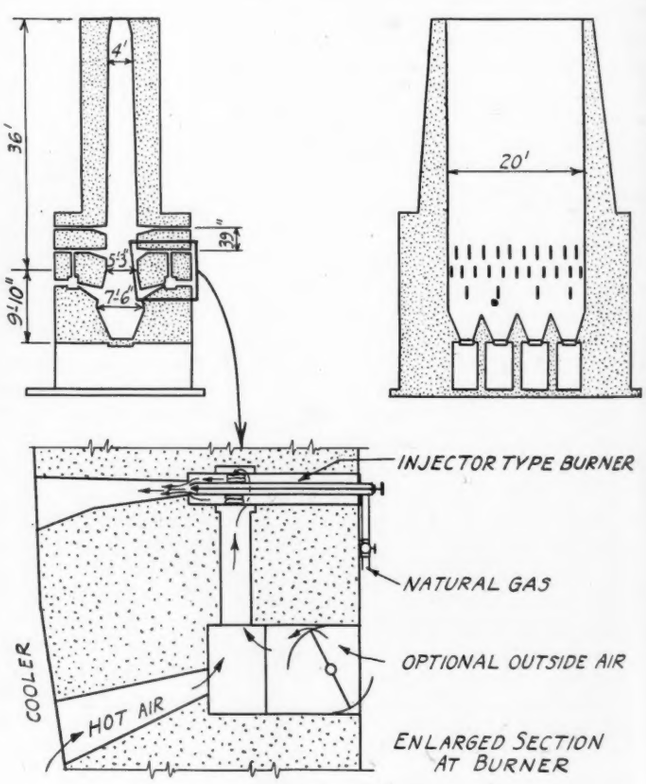


Fig. 153. Novel system of applying gas to lime kiln

as they had could stand for more than a week or two at most. As no attempt was made to temper the conditions by admitting waste gas from the kiln top or with steam or any other means, the kiln had to be radically changed to make gas burning possible. The design was theoretically perfect, but in practice was a failure, and as there was no one to point out a simple way out of the difficulty, the whole system was later changed in a radical way.

The high efficiency of this kiln is, however, certainly a revelation. Another instructive point is that gas was admitted through 42 burners, and as 40 tons of lime were made, there was, so to say, a burner for each ton. The eyes were very small, gas and air entered with considerable velocity, and so there was great penetration into the kiln charge. Between the high penetration and the many admission points the result was a very uniform distribution of heat, but all of this was defeated by the failure to moderate the temperatures to a point where the refractory would stand up.

So we come to a point where five entirely different natural gas lime kilns were studied, all of them imperfect, but from each of which we were able to learn something which summarized as follows:

(1) A natural gas kiln should have a deep cooler and practically all air should enter through the lime in the cooler.

(2) The gas should be admitted at many points. It should be admitted directly into the kiln shaft and the admission points should be small enough so gas can enter with considerable velocity and penetration.

(3) There should be a provision for tempering of furnace conditions with hot waste gas when such tempering appears advisable.

(4) The kiln should be operated under an induced air system, but in such a way that, as the temperature of the waste gas at the fan varies, the draft will not vary; in other words, there should be automatic draft control.

This last is important, as it is unreasonable to expect best results from a fuel of steady supply if the air admitted for its burning is not correspondingly steady.

At one American plant 6000 cu. ft. of natural gas is used per ton of high calcium lime, and the writer believes that if the vertical kiln is properly designed for natural gas a consumption somewhere between 4500 and 5000 cu. ft. per ton of high calcium lime and much less for magnesian lime should be attained.

Natural Gas in Rotary Kilns

Natural gas is used for burning lime in rotary kilns as well as for sintering dolomite and burning cement. As the rotary kiln cannot abstract heat from a stream of hot gas as well as the vertical kiln, greater care must be taken to make natural gas economically practical. The writer has seen installations where no attempt was made to recover heat from the finished product discharged from the kiln, and cold air was used entirely for burning the gas. The burners were such that the mixtures were so intimate that combustion was almost instantaneous, with hardly any flame visible; in addition, no care was taken in proportioning air to gas, so that too much air was used. Naturally, results were poor but should not be blamed on natural gas.

In the case of no other fuel is it as important to use a lime cooler as an air preheater in conjunction with the rotary kiln. Every possible precaution must be taken to send back into the kiln the sensible heat contained in the discharged product. The burners should be of a design to give radiant and long flames, which means retarded access of air to the gas. If radiancy is not obtained, a rotary kiln, being dependent on radiation for heat absorption, cannot perform properly. This is not only important for efficiency but also for capacity.

The results of an installation where natural gas was used for burning and sintering of dolomite, and in which all of the above mentioned requirements were violated, are of interest. Needless to say, capacity was low, and fuel efficiency also. The temperature of the waste gas leaving the kiln was 1600 deg. F. As dolomite begins to decompose at 1378 deg. F., a waste gas temperature of 1600 deg. F. indicates that fresh stone was heated with heat of high elevation that should have been used for decomposition, and so not only all of the heat of low elevation but also much of the heat of high elevation was wasted from the kiln.

This waste was reflected in gas analysis, and the CO_2 content of the escaping gases was about 14%, only 2 or 3 deg. higher than that obtained in boiler practice where none is obtained from decomposing carbonates but all from the carbon in the gas. Gas consumption per ton of product was 15,500 cu. ft., startlingly high, particularly if we consider that the Ohio kilns with natural gas and dolomite produce a ton for about 4500 cu. ft. Of course, in this latter case the heat requirements are not as high, but the difference is not great. The only addition in the case of sintering is an increased temperature and corresponding increase of sensible heat in the product with the chemically imparted heat remaining about the same. The efficiency was only about 15%, while a rotary kiln burning high calcium lime has an efficiency of at least 35%.

Sintering dolomite, although simple in principle, is much more exacting in practice than lime burning. The temperature at the finishing end has to be very high and must be between a narrow range. It is easy to upset things so that more fuel will be burned, the gas velocity through the kiln becoming greater, time for heat absorption shorter, and so on. Assuming that the highest temperature was only 2500 deg. F., that would have been insufficient to properly deadburn the dolomite. No amount of burning would then have given the desired product, capacity would have been nil, and efficiency zero. Still, under the same conditions, if the dolomite only required calcining, results would have been fair. If a cooler had been used to preheat the air, higher initial temperatures would have been secured and the results would have been much better.

Fig. 156. Roumanian rotary kiln plant with unusual burner

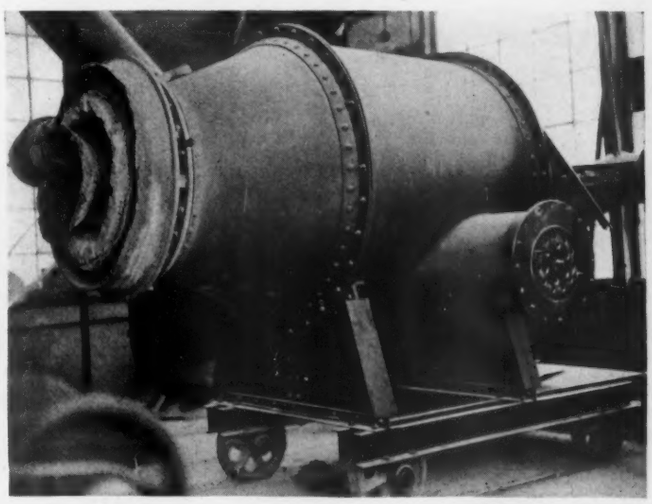


Fig. 157. Burner for natural gas as used at Roumanian plant opposite

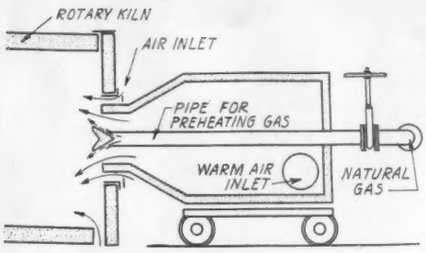


Fig. 158. Sectional view of natural gas burner at Roumanian plant

The writer was able to visit the large natural gas burning plant located at Dioiosanmartin, Transylvania, Roumania. In this plant artificial nitrogen fertilizer as well as carbide was manufactured, for each of which lime was needed, some made in vertical kilns but most in a rotary kiln. This rotary was 200 ft. long and 6½ ft. in diameter. It produced either 90 or 45 tons of lime per day. When producing the larger quantity, 7700 cu. ft. of gas were used per ton, and for the smaller capacity, naturally the larger amount of 12,000 cu. ft. per ton.

The kiln plant is shown in Fig. 156. It consists of rotary and cooler conventionally arranged. The burner used, Fig. 157, is shown also in section in Fig. 158. The warm air from the cooler is blown into the burner chamber through which the gas line passes, the idea being to preheat the gas, but apparently the fact was lost sight of that the air loses more heat than the gas gains and so the kiln is the loser. The burner tip is interesting but not conducive to a very luminous flame. While in this case the gas consumption for a rotary is not at all high, it could be bettered.

The writer was told that the kiln is repaired once every three years. This is the first rotary he has heard of having anywhere near as long a running period. One can look upon this in any way he wishes, good or bad; good from a repair cost standpoint and bad from a fuel efficiency standpoint. High efficiency means high temperatures, while long running periods may mean lower than desired temperatures. There are other modifying factors, such as the kind of refractory and expertness of its application, but three years for a rotary lining is almost too much.

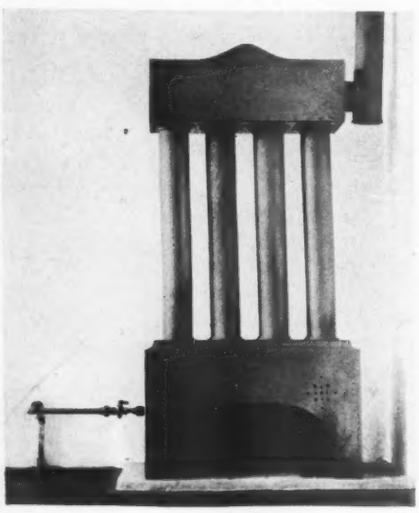


Fig. 159. Office heater made of old boiler tubes

As one goes through this plant he finds that natural gas is used almost altogether for heat. In this region it is very cold in winter and stone in the bunkers freezes, so they keep them warm with natural gas, which can be piped as conveniently as water. In the offices one finds in use natural gas heaters, as the one shown in Fig. 159, made in their own shop out of old boiler tubes. In the boiler plant also natural gas is used, as shown in Figs. 161 and 162. Boiler room performance is very good, the CO_2 being 10.5%, while the theoretcal maximum is 11.7%. They have 12 boilers, six Stirling and six of the straight water tube type, each having from 27 to 32 burners, and they can burn 35,000 cu. ft. of gas per hour under each boiler. Most of the steam is used to generate electric current for the electric carbide furnaces. This plant when in full operation uses almost 9,000,000 cu. ft. of gas a day, equivalent to around 375 tons of coal.

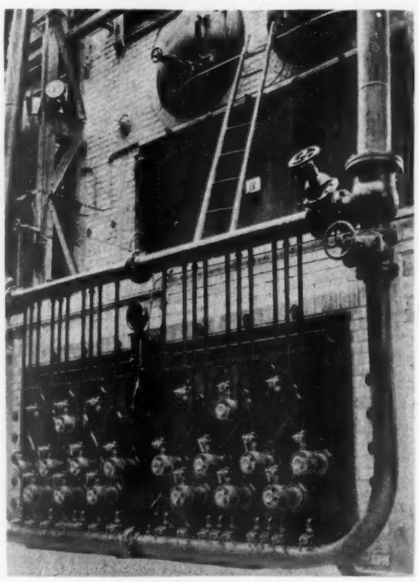


Fig. 161. Boiler installation using natural gas

There is only one more point the writer wishes to bring out as far as this plant is concerned, and that is the contrast between the elaborate and carefully thought out burner application to the boilers as compared to the crude way that natural gas is often applied to lime kilns, while exactly the opposite should be true.

Just how much can be accomplished by relatively small changes is proven by the experience of an American plant using a rotary kiln with natural gas. The burner used was one creating an intimate mixture and so causing a very short flame. It was then changed to a type supplying gas and air in independent layers of little turbulence. Immediately the flame lengthened out, stack temperatures reduced from 1290 to 1020 deg. F., capacity increased from 5000 to 5400 lb. and gas consumption reduced from 4.04 to 3.75 cu. ft. per lb. of product, but this product was not lime. In the same plant with ordinary burners and without preheated air, 9600 cu. ft. of gas were used per ton of lime.

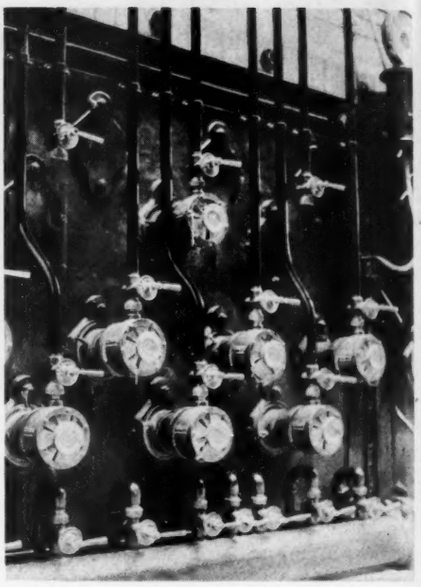


Fig. 162. Natural gas burners under boilers at Roumanian plant

Closing the discussion of natural gas application to rotary kilns, it appears that what is necessary is: first, conservation of all heat generated, by insulation, by care in returning as much as possible of the heat in the lime leaving the kiln back into the kiln, and by proper proportioning of air to gas so that stack wastage due to excess air is at a minimum. In addition, the burner design should be such that the flame is long and radiant; and as natural gas can be piped in any way and delivered in any shaped stream, this should be readily accomplished. In closing it may be said that no one has yet, to the writer's knowledge, worked out just the right combination for the most effective use of this wonderful fuel.

(To be continued)

Proposes Mineral Survey of Western North Carolina

STEPS for having the North Carolina state geologist make a thorough survey of the minerals in the counties of western North Carolina were expected to be proposed by J. Q. Gilkey, of Marion, when the state board of conservation and development met in Raleigh recently.

There has been considerable interest shown in a movement to have this survey made, Mr. Gilkey said, and he will seek to have more money allotted to the mountain counties for this purpose.

Finding the Best Grading for Aggregates

Producers Who Want Concrete To Be Best Obtainable Should Know How to Grade Aggregates for This Result

By Edmund Shaw
Contributing Editor, Rock Products

THERE was an increase of 19% in the strength of concrete laid by the city of Los Angeles between 1929 and 1931. No more cement was used and there was no improvement in the quality of the cement. The aggregates were the same. The improvement was due entirely to a study of the grading of the aggregates and the adoption of gradings which are best suited to the local materials and the method of finishing.

One should say at the start that no additional burden was laid on the producer of aggregates. The producers were asked to make coarse aggregate in three sizes (called coarse rock, fine rock and pea gravel) and sand in two sizes (concrete sand and plaster sand). This is now the practice almost everywhere in California and it is getting to be the custom in many other parts of the United States. The proportioning and combining of these separate sizes was done under the direction of the city's engineers and inspectors, using the methods worked out by H. P. Cortelyou, engineer of construction, of the city of Los Angeles.

The actual figures of compressive strength were: 1929, 3630 lb.; 1930, 3960 lb., and 1931, 4320 lb. But such figures do not mean much unless it can be shown that all the conditions were comparable. For this reason the figure really used by Mr. Cortelyou for comparisons of this kind is not the strength but the strength ratio. This is the ratio between the strength of the concrete and the strength of the cement in the ordinary 1:3 mortar compressive test, which is made as a matter of routine for all cements that are used by the city. This, as Mr. Cortelyou points out in a report, "automatically eliminates from the results the effects of variation in strength of different lots or brands of cement, and this variation is very much greater than is commonly realized, being as much as 1400 lb. per sq. in. when the average of all cements is about 3700 lb. at 28 days.

The comparison of these ratios of concrete strength to cement strength is as follows:

1929, ratio 0.99.
1930, ratio 1.12 (increase of 12% over 1929).
1931, ratio 1.20 (increase of 20% over 1929).

As there has been no increase in cement strength (in the brands used) in the last three years, these percentages are practically the same as those of the actual strengths.

Aggregates Delivered in Separate Sizes

The report from which these figures are taken, dated March, 1932, says that a start was made in October, 1929, by keeping complete records of all large concrete pavement projects and applying to them the methods that had been worked out for viaducts and bridges. This called for delivery of aggregates in the separate sizes mentioned. Later, the Board of Public Works gave permission to vary the proportions of fine to coarse aggregate provided the proportion of cement to the total aggregate was not changed. An increase in strength and better workability resulted from the use of separate sizes of aggregate, but a still better workability and increased strength were secured by varying the proportions of fine and coarse aggregate for the kind of concrete wanted and according to the characteristics of the local materials. For in this way both strength and workability were brought under control.

Uniformity is considered almost as important as strength in concrete by the engineers of today, and concrete being a not very homogeneous material, the uniformity is considered quite satisfactory if the strength of individual specimens does not depart by more than about 10% from the average of all strengths. The report shows that the uniformity as well as the strength and workability of the concrete was improved by the methods adopted, the figures being:

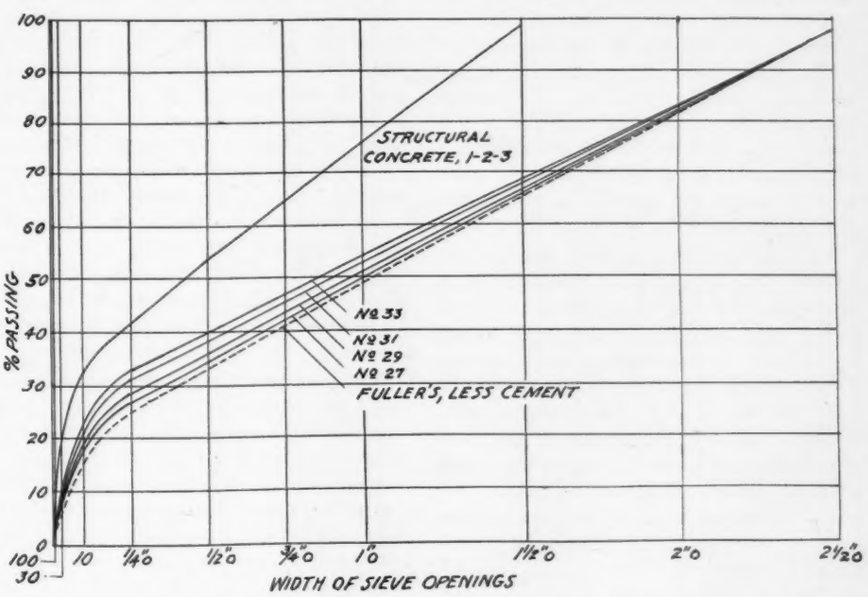
1929, departure from the average, 10.8%.
1930, departure from the average, 10.2%
1931, departure from the average, 9.5%

In making up these figures only those projects in which the measurements of aggregate were by weight were considered. This eliminated variations due to bulking and so on. But there were enough of these projects, and they were large enough, to insure that the averages were real averages, as the table shows:

Calendar year	Number of projects	Total area in sq. ft.
1929	11	6,754,562
1930	21	9,353,534
1931	21	4,489,210

Exhaustive Study of the Effect of Grading

After reading this report the writer went to Mr. Cortelyou and was told something of the study that led up to the adoption of present methods, a study which, in the writer's opinion, is one of the most exhaustive investigations of the effect of grading on the qualities of concrete that has been made, at least in recent years. It included "jump" gradings and gradings for greatest



Gradings of structural and paving concrete compared with average Fuller's curve, less cement

density as well as the ordinary sorts. It is to be hoped that Mr. Cortelyou will soon put this work in a paper so that it will be available to all the concrete industry.

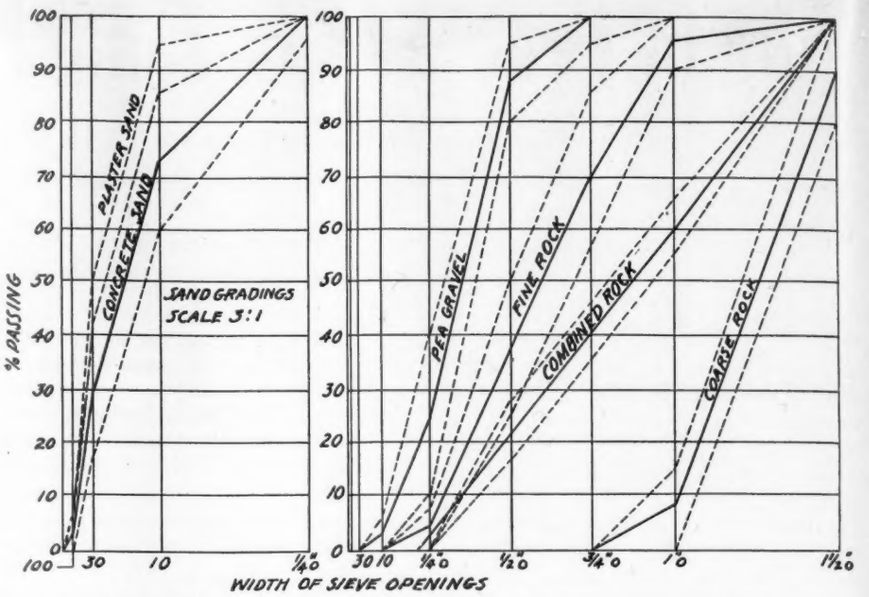
In the end the study came back to the type of grading known as Fuller's curve, a type which has stood first in a number of investigations made in Europe as well as in the United States. Mr. Cortelyou's work brought out what most of us have known and forgotten, that there is no *definite* grading which plots as Fuller's curve. Fuller himself gave three curves, one for sand and gravel, one for sand and crushed rock and one for screenings and crushed rock. Mr. Cortelyou found none of these was the best for the aggregates of the Los Angeles district which (containing much crushed gravel) has characteristics between gravel and crushed rock.

He also found that the grading should be modified according to the use to which the concrete was to be put and the mixing and placing and finishing. This sounds somewhat complicated, but four standard gradings, or ideal gradings, are all that have been found necessary. They are known as No. 27, No. 29, No. 31 and No. 33. The numbers are the percentages of each that will pass a ¼-in. round hole sieve (the full gradings being given in the table). No. 27 and No. 29 are for concrete paving with machine finish. No. 31 is for paving with hand finish and No. 33 is for more general use. All of them contain somewhat more fines than Fuller's grading, but it was considered well to sacrifice a little something in economy of cement for the sake of workability.

Computations of Mix Are Simple

One of the objections that engineers have raised when it was proposed to use a grading curve is that computation of the proportions is long and tedious, and that the sieve analyses of the separate materials are not constant. The amount of time taken to do the calculating is a matter of doing it systematically and of practice. The writer finds that by plotting the ideal curve it is easy to get a fair idea of the percentages of the separates. Then two or three trials will serve to adjust the grading so that it will plot within the limits of tolerance.

The city uses ready-mixed concrete and concrete that is mixed on the job. With ready-mixed concrete the grading is figured by the plant superintendent and checked by one of the city's engineers, or vice versa. As all the concrete materials are very carefully sampled as they are placed in the batcher bins the actual grading of the complete aggregate is sure to come out about as it is figured. But on the other jobs which the writer has seen, almost the same accuracy is possible, the separates being stored in portable bins and carefully sampled as received. The writer would say that *combining to an ideal curve is perfectly practical if there are enough separates and if they are properly sampled and stored as they are received.* Experience has shown this to be true.



Simplicity of plot on daily report form is shown by comparison with plot of the same gradings made in the usual way

Use of Charts

For keeping track of the grading of the separates the chart on the daily report shown here is used. There are two forms of this chart, one for paving concrete and the other for concrete for bridges and similar work, which is the form given here. It differs from any other plot of which the writer knows in that it is so simple that a great deal of information can be plotted accurately on a small area. The basic principle, the representing of the ideal grading for the material by a straight line, is one that is also used in the plots of the California State Highway Department.

The lines which show the coarse and fine limits, above and below the center line of ideal grading, form a polygon, and any grading which plots inside of this polygon is, generally speaking, permissible. But sands for structural work should plot above the center line of the sand figure, while sands for street paving should plot below it.

(In order that the reader may appreciate the advantages of this simple form of plot, the writer has plotted the curves that show ideal grading and fine and coarse limits in a graph of the kind most used for illustrations.)

Projecting above the polygon giving the limits for concrete sand are scales which show the limits for a finer sand, called plaster sand locally. This, Mr. Cortelyou explained, is combined with what is called concrete sand, the grading given by the center line of the polygon, to make a fine aggregate for structural work.

He said concerning this: "Of course we have found, as everyone else has, that for a given cement content we could make the strongest concrete with coarse and well washed sand, provided the fines in it were not below a certain limit. But in structural work, bridges and the like, in which reinforcing is used, we are willing to use slightly more cement to gain plasticity and workability. And so we add a little unwashed plaster sand to the concrete sand."

Unwashed Fine Sand!

Unwashed sand! This sounded like dangerous doctrine to the writer, remembering the failures by disintegration that have been laid to unwashed fine aggregate.

"But," Mr. Cortelyou explained, "the unwashed sand here will often fill the specifications for washed sand in many parts of the United States. There is generally a limit of 3% removable by elutriation. The unwashed sand I speak of has from 2½ to 3½% removable by elutriation and of that not more than 1½% is clay, the remainder being fine sand and rock dust.

"The sand we use for structural work, as blended, averages about this grading:

Passing No. 100	5%
Passing No. 30	35%
Passing No. 10	80%
Passing ¼-in. round	98%

"The ideal, or standard, coarse aggregate grading given in the chart is a straight-line grading, made by combining coarse rock, fine rock and pea gravel. When these combinations are made we have a sand and a coarse aggregate of known gradings and we can combine them in fixed proportions (we generally use 1:2:3) to make a complete aggregate of known grading. We have found this method of working by fixed proportions to be very satisfactory on structures."

I asked Mr. Cortelyou about his methods of designing a mix, aside from designing the grading. To this he answered:

"All methods of design which are based

on water-cement, or cement-water ratio, on fineness modulus, or surface areas, or other relation or characteristic, are more or less interdependent and are different ways of getting at the same thing. What we try to do is first of all to get a concrete of the required workability for the particular use, and this can be obtained with the least amount of mixing water if the aggregate grading is 'smooth' and provides a low percentage of voids. The required workability will be determined by the use of the concrete, the methods by which it will be placed, how it is to be finished and so on. This fixes the amount of water. With the water fixed the strength will depend upon the cement factor.

"The voids in the local coarse aggregate range from 34.5 to 36.1% and we have found that with any good grading, a grading that one would care to use in making concrete, the percentage of voids is about the same. Hence it does not seem important to consider the ratio of mortar to voids very much. There must always be an excess of mortar over what is required to fill the voids, the amount of excess depending on the use, and if the proper excess is provided by the proportion of fine to coarse aggregate there will be enough for the highest as there is for the lowest percentage of voids."

The writer feels that Mr. Cortelyou's work is of great value, not only to the city of Los Angeles but to the whole concrete industry. The value and importance of grading the aggregates as closely as possible to an ideal has long been known. But most engineers have felt that the combining of aggregates to such gradings was impracticable. Mr. Cortelyou has shown that it is quite practical and his experience as recorded in the work of the past three years shows that it pays and pays well. For the better concrete has cost the city not one penny more.

Progress in Open Pit Mining

PROGRESS in open pit mining methods on the Lake Superior iron ranges is noted by Max H. Barber, district superintendent, Cleveland-Cliffs Iron Co., Hibbing, Minn., in a paper presented at the February, 1932, meeting of the American Institute of Mining and Metallurgical Engineers at New York.

Increased footage of blast holes has been obtained by using modern all-steel drilling equipment and maximum breakage has been obtained by a better placing of the holes.

Steam shovels are being replaced by 2- to 5-yd. electric shovels and 8- and 10-yd. electric shovels are favored for stripping. The trend is toward greater use of alloy castings for strength along with light weight and ball and roller bearings which can be replaced quickly, according to Mr. Barber. Air-operated side-dump cars of 16- and 20-yd. capacity are being replaced by cars of 30-yd. capacity.

Electric haulage is being used at four pits, 60-ton General Electric locomotives being used at the Wabigon and Mesabi Chief mines of M. A. Hanna Co. and eight 75-ton General Electric locomotives with side collectors being used at the Hill-Annex mine of Jones and Laughlin Co. The type of electric locomotive made by the Differential Steel Car Co. as used at the Manistique, Mich., plant of the Inland Lime and Stone Co. is also meeting with favor, according to Mr. Barber.

More attention is being paid to the treatment of low grade ores and so-called jig ores, there being now 19 washing plants on the range. Sintering of low grade ores is also receiving considerable attention, with two sintering plants in the district, one at Evergreen on the Cuyuna range and one at Chisholm on the Mesabi range.

FORM NO. 613
8-19-30

DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING — CITY OF LOS ANGELES
INSPECTION DIVISION

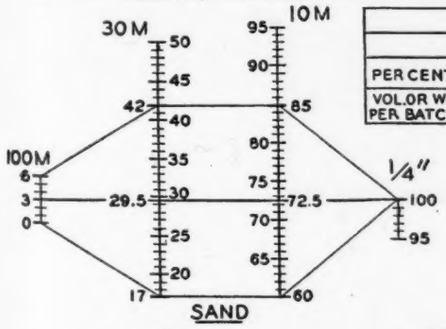
REPORT OF CONCRETE PROPORTIONS AND POUR

SHEET NO.____

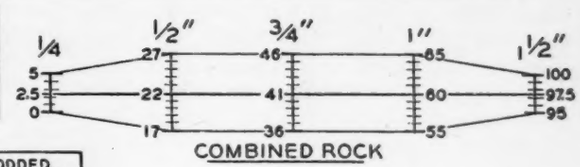
JOB____ PART OF STRUCTURE____ DATE____
CONTRACTOR____ BRAND CEMENT____ TIME OF MIX____ SECS.
RES. ENGINEER____ SACKS PER BATCH____ CU. YDS. POURED____
LAB. INSP.____ SACKS PER CU. YD.____ CU. YDS. PER HR.____
BUNKER INSP.____ NO. SACKS IN POUR____ TIME OF START____
MIXER INSP.____ ADMIXTURE BRAND____ TIME OF FINISH____
PLACING INSP.____ AMOUNT PER SACK____ TOTAL HOURS____
SAND SOURCE____ ROCK SOURCE____
REMARKS____

PROPORTIONS	SLUMP	CASE NO.	SAMPLE NO.	STRENGTH

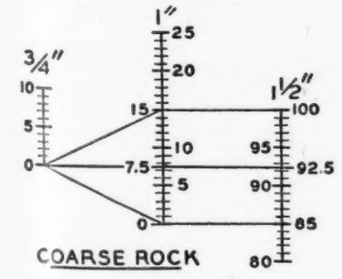
NO. MEN MIXING PLANT____
NO. MEN PLACING____

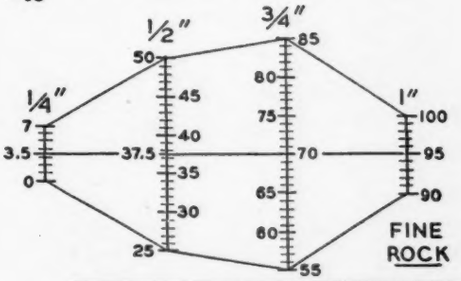


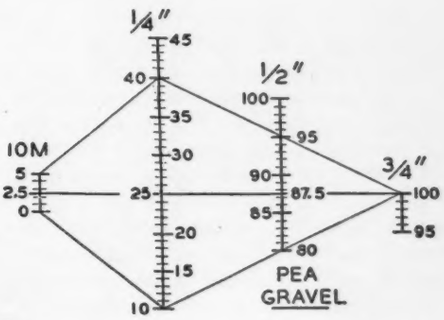
SAND	PLASTER	CONCRETE	COMBINED
PER CENT			100
VOL. OR WT. PER BATCH			



WT. PER CU. FT. - DRY RODDED.	
SAND	LBS.
COMBINED ROCK	LBS.





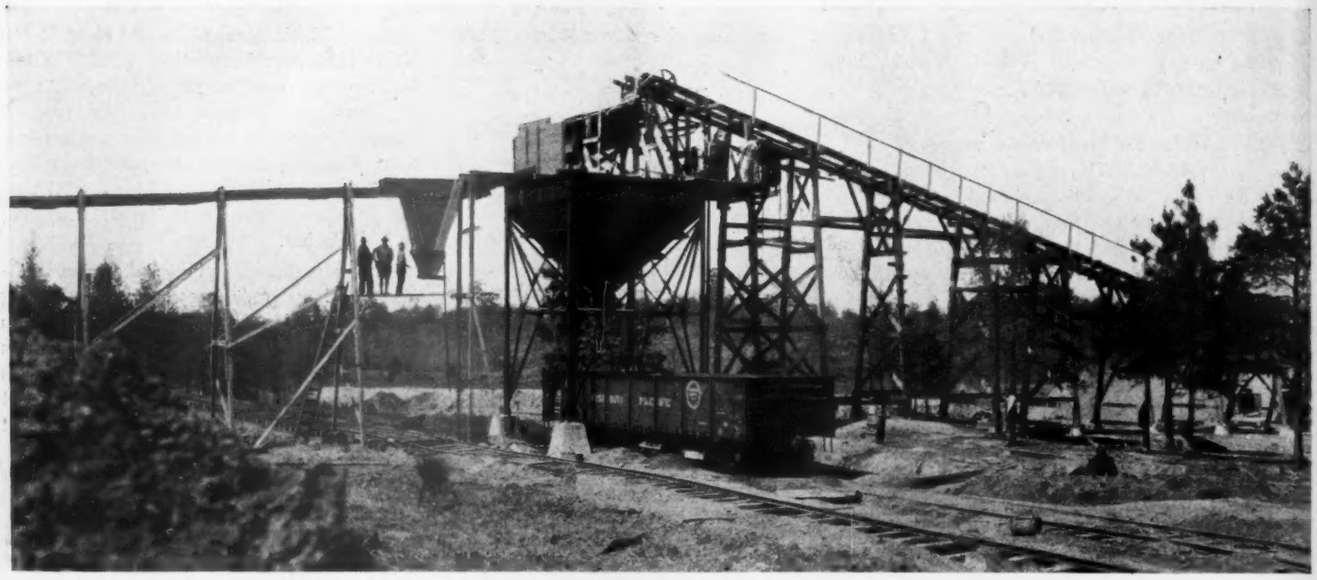


	COARSE ROCK	FINE ROCK	PEA GRAVEL
PER CENT			
VOL. OR WT. PER BATCH			

Daily report of concrete construction in Los Angeles includes the grading and proportioning of aggregates

A 2000-Ton Per Day "Standard Parts" Sand and Gravel Plant

A Design That Typifies Simplicity in Erection Details — Hence Can Be Easily Moved



Standard steel plate hopper, vibrating screen, home-made sand cone comprise this simple sand and gravel plant

A SPECIAL type of sand and gravel operation has been developed in the South, in a locality where the deposit is relatively shallow—deposits laid down by former streams apparently. The ordinary type of operation for this kind of a deposit is a pump dredge, as frequently described in Rock Products. Pump dredges have always been used here because these deposits contain much clay and silt, and the pumping and repumping are as much desired for cleaning as for excavating and rehandling. A typical operation is shown in the accompanying illustration.

Recently a newcomer built a plant in this locality and introduced some novel ideas. Unfortunately, this producer desires no publicity so we are unable to say that his method proved more successful than his competitors' or not. The chances are it was not and that is the reason he desires no publicity. However, we may be wrong in this surmise; he may be so successful he does not desire to advertise it. The editor will have to leave the reader to draw his own conclusions. In any event the new plant contains interesting features, which if not successful under the conditions described might be so elsewhere.

The new producer uses two 3½-yd. Bucyrus-Monighan walking draglines driven by crude oil engines, and three Northwest gasoline-engine driven draglines, two 1-yd. machines and a 1½-yd. machine.

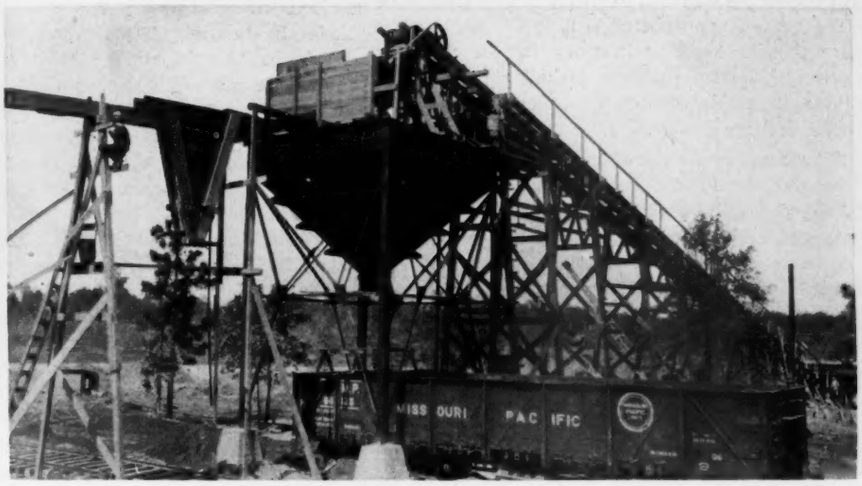
In this district the gravel deposits are said to be quite variable; in some cases the gravel is exposed on the surface and in others covered with considerable clay or sand, or both, as overburden; hence these operators chose dragline equipment that will permit them a greater freedom of choice of raw material than would be the case if they used dredging equipment.

The plant was designed by the engineering staff of Barber-Greene Co., Aurora, Ill., and is quite simple, though rated at a capacity of 200 tons per hour of washed gravel. The standard-gage gondolas from the pit discharge to a steel Heltzel bin which serves as a track hopper, the cars reaching this hopper by means of an earth fill.

A reciprocating pan feeder discharges the track hopper to a 30-in. inclined belt conveyor, the pan feeder being driven from the tail pulley of the belt conveyor. The inclined belt in turn discharges to a 4-ft. by

Use of draglines for excavation permits "choosing" raw material

Loading hopper is a standard steel bin, "semi-permanently" erected



Close-up of car-loading bin and sand cone—no storage bins are used

And this is the type of plant used by competitors in the same locality

8-ft., two-decked Niagara vibrating screen, mounted over a second Heltzel steel bin, which receives the washed gravel. From this bin the gravel is drawn direct to cars for shipment. All of the moving parts of the plant are Alemite lubricated to reduce friction to a minimum.

The Niagara screen purchased was a single-decked screen, but the operators have provided it with an upper deck. The sand from the lower deck passes to a home-made sand settling box which discharges direct to cars.

A novel feature of the plant is the use of a 65-hp. Waukesha gasoline motor for driving the belt conveyor and the vibrating screen. The latter is driven by belt from the tail pulley of the belt conveyor. Other novel features are the use of standard portable, or easily demountable, units throughout the plant.

Water is supplied the screen by a 800-g.p.m. Jaeger non-priming pump, which is direct-connected to a 25-hp. Hercules gasoline engine. This unit is a very compact and serviceable arrangement and will deliver water at 65 lb. pressure under a 65-ft. hydrostatic head. A 6-in. suction line is used and a 4-in. discharge line serves the plant.

Gasoline-engine-driven pump

The New Telomat

IMPROVEMENTS made in the telomat are explained by W. H. Bliss in Bulletin No. 29 of the Maine Technology Experiment Station of the University of Maine at Orono, Maine.

The telomat is a device designed to give supervisory remote control of a number of electrical circuits by means of sound signals sent over an ordinary telephone line. It is arranged so that it operates the hook switch, receives signals from the telephone and sends signals back into the line.

In the apparatus described any one of five circuits may be opened or closed by sending a signal over the telephone line and the condition of the circuits, whether open or closed, is automatically signaled back to the distant operator.

The device is applicable to remote control of a pumping station, substation or similar equipment.

Crushed Stone Sizes

Recommended Standards

A. T. GOLDBECK writes of the present unstandardized sizing system: "It is unthinkable that engineers and the industry should be willing to continue under our present lack of system in crushed stone sizes. We are in the same state of chaos and uneconomic production in the aggregate industries that would exist in the metal industries did we not have standard sizes for sheet metal, pipe, wire, rods, etc."

But before standardizing on sizes, Mr. Goldbeck says that the method of measuring should be standardized. Although he is more accustomed to the use of round hole screens, he is in favor of the use of square holes, for the reasons that are obvious to those who have studied the matter. The article gives a table of equivalents of round and square holes which is based on Kitt's ratio, which says that a square hole 1 in. in diameter and a round hole 1.21-in. diameter are equivalents in screening.

The article lists 21 uses for crushed stone by which the size is influenced, these uses being grouped as (1) concrete aggregates, (2) macadam type roads, (3) bituminous concrete roads, (4) filters for sewage, (5) railroad ballast, (6) agricultural limestone, (7) fluxing stone, (8) stone dust for various purposes. This does not include all the uses, but includes those to which the bulk of the crushed stone production goes.

These uses have been studied, along with the representatives of the other aggregate industries, Hubbard and Love representing slag; Walker, sand and gravel; and the author of the paper, crushed stone. They have decided that 12 sizes are enough and have worked out the table which is reproduced here. It is noted that most of these sizes have been adopted as standard by the American Society for Testing Materials or by the Federal Specification Board.

Discussing the sizes and uses, the paper says of concrete aggregates that it is economy to use large sizes as much as possible. It is cheaper to crush the ledge rock coarsely and it is cheaper to use aggregates of the largest maximum size that the nature of the work will permit, as this reduces the amount of cement paste needed to cover the surfaces. The gradations numbered 7, 8, 9, 10 and 11 are thought to be satisfactory for all the principal uses of concrete, including everything from thin sections to cyclopean concrete in large masses.

For roads of the macadam type, where the material should not be too large to be dragged readily, gradings 9, 10 and 11 are suggested. For waterbound macadam a more or less one-size stone is advocated, and for hard trap the size should be 1- to 2-in., with a grading like No. 4. For softer limestone the 2- to 3½-in. grading, No. 2, may be used. Screenings to use for filling and for cementing the larger pieces together may have No. 12 grading or a combination of No. 11 and No. 12 gradings.

Surface-treated macadam needs a stone that is not dust-covered, so that the bituminous material will adhere to it, of a size large enough to be stable and that will produce a non-skid surface. Gradations Nos. 10 and 11 are recommended for such use.

Bituminous macadam roads are now built with both hot cementing material and with bituminous emulsions which are almost as liquid as water and can consequently penetrate very deeply. For the hot mix, trap rock 1- to 2-in. or 1½- to 2½-in. is generally used and softer rocks are used 2- to 3-in. or even 2½- to 3½-in. For trap rock therefore gradings No. 3 and No. 4 are recommended and for soft rock grading No. 2. The key stone or choke stone, which fills the voids to make a thoroughly compacted surface, should be No. 4, ¾-in. with the 1½- to 2½-in. material. This should be graded as in No. 10. For the 2- to 3-in. or 2½- to 3½-in. coarse aggregate the choke stone should be ¾- to 1½-in. and should have No. 5 gradation.

Bituminous concrete is used in the article to include the hot mixed bituminous concretes, the special cold mixes, the binder coarse for sheet asphalt and the mixed in place of bituminous concrete. Economy demands the highest percentage of coarse aggregate in such mixtures. It is also necessary that the grading produce the most economical mixture with the greatest density. As with portland cement concrete, a straight-line gradation for the coarse aggregate has been found excellent. For the No. 4 to 2-in. and No. 4 to 1-in. gradations 7 and 9 might be used, and for the No. 4 to 1½-in. gradation No. 8. For hot mix, fine graded bituminous concrete, gradations No. 10 and No. 11 may be used to advantage.

The stone for the bottom course recommended by the Amiesite Co. does not correspond with any size or combination given in the table, but that recommended for the top course closely corresponds to grading No.

JOINT TECHNICAL COMMITTEE OF THE MINERAL AGGREGATES ASSOCIATIONS

Proposed Standard Sizes of Coarse Aggregate Intended to Cover Requirements for All Localities

No.		Nominal size, sq.	Circular equiv.	3½-in.	3-in.	2½-in.	2-in.	1½-in.	1-in.	¾-in.	½-in.	⅜-in.	No. 4	No. 8	No. 100
	1	2½-in.–3½-in.	3-in.–4¼-in.	90–100	35–70	0–15									
	*2	2-in.–3½-in.	2½-in.–4¼-in.	90–100	50–80	20–50	0–15								
	3	1½-in.–2½-in.	1¾-in.–3-in.			90–100	35–70	0–15							
F,A	4	1-in.–2-in.	1¼-in.–2½-in.				90–100	35–70	0–15						
F,A	5	¾-in.–1½-in.	⅞-in.–1¾-in.					90–100	20–55	0–15					
F	6	½-in.–1-in.	⅝-in.–1¼-in.						90–100		0–15				
F,A	7	No. 4–2-in.	¼-in.–2½-in.				95–100		35–70		10–30		0–5		
F,A	8	No. 4–1½-in.	¼-in.–1¾-in.					95–100		35–70		10–30	0–5		
F,A	9	No. 4–1-in.	¼-in.–1¼-in.						90–100		25–60		0–10		
F,A	10	No. 4–¾-in.	¼-in.–⅞-in.							90–100		20–55	0–10		
F,A	11	No. 4–½-in.	¼-in.–⅝-in.								90–100		0–15	0–5	
F	12	0–No. 4	0–¼-in.										85–100		10–30

*Note: Federal Specification Board size 2-in.–3-in.
Sizes adopted by Federal Specification Board designated by "F."
Sizes adopted by American Society for Testing Materials designated by "A."

Proposed Standard Sizes of Coarse Aggregate for Use in Any One Specification or Locality
Group No. 1

No.		Nominal size, sq.	Circular equiv.	3½-in.	3-in.	2½-in.	2-in.	1½-in.	1-in.	¾-in.	½-in.	⅜-in.	No. 4	No. 8	No. 100
	2	2-in.–3½-in.	2½-in.–4¼-in.	90–100	50–80	20–50	0–15								
F,A	4	1-in.–2-in.	1¼-in.–2½-in.				90–100	35–70	0–15						
F	6	½-in.–1-in.	⅝-in.–1¼-in.						90–100		0–15				
F,A	7	No. 4–2-in.	¼-in.–2½-in.				95–100		35–70		10–30		0–5		
F,A	9	No. 4–1-in.	¼-in.–1¼-in.						90–100		25–60		0–10		
F,A	11	No. 4–½-in.	¼-in.–⅝-in.								90–100		0–15	0–5	
F	12	0–No. 4	0–¼-in.										85–100		10–30

Proposed Standard Sizes of Coarse Aggregate for Use in Any One Specification or Locality
Group No. 2

No.		Nominal size, sq.	Circular equiv.	3½-in.	3-in.	2½-in.	2-in.	1½-in.	1-in.	¾-in.	½-in.	⅜-in.	No. 4	No. 8	No. 100
	1	2½-in.–3½-in.	3-in.–4¼-in.	90–100	35–70	0–15									
	3	1½-in.–2½-in.	1¾-in.–3-in.			90–100	35–70	0–15							
F,A	5	¾-in.–1½-in.	⅞-in.–1¾-in.					90–100	20–55	0–15					
F	6	½-in.–1-in.	⅝-in.–1¼-in.						90–100		0–15				
F,A	8	No. 4–1½-in.	¼-in.–1¾-in.					95–100		35–70		10–30			
F,A	10	No. 4–¾-in.	¼-in.–⅞-in.							90–100		20–55	0–10		
F,A	11	No. 4–½-in.	¼-in.–⅝-in.								90–100		0–15	0–5	
F	12	0–No. 4	0–¼-in.										85–100		10–30

11. Tarvia-lithic mixture is made with three courses. For a finished depth of 2½- to 3-in. No. 4 grading, 1- to 2-in., may be used for the bottom, No. 6, ½-in., for the middle and No. 11, No. 4 to ½-in., for the top. These are the closest approximations to the round-hole screen grading recommended by the manufacturers.

The No. 4 gradation, No. 4 to 1-in., meets all requirements for a sheet asphalt binder.

Mixed in place bituminous surface concrete has now become highly important. Gradation No. 6, ½- to 1-in., applies to mixed in place surfaces, as they are generally constructed for thicknesses of 1½- to 2-in.

Stone for trickling filters if satisfactory in other ways may be given the No. 5 grading, ¾- to 1½-in., provided extra care is taken to secure thorough screening on the small size screen. This will satisfy many specifications. Railway ballast grading specifications are not satisfied by any grading in the table, although a combination of No. 4 and No. 5 might be suitable. The gradings for agricultural limestone, fluxstone and stone dust really lie outside the scope of the committee's work and the discussion of them would be somewhat involved.

The paper closes with the hope that producers will study the proposed standards to see how they fill their needs, and says that this fact is outstanding: *the sizes of mineral aggregates should be standardized.*

Increased British Cement Production

(Consul Robert B. Macatee, London, in "Commerce Reports")

AS PRODUCERS of cement, Great Britain and France rank after the United States and Germany. Great Britain contributes 7.5% of the world's supply compared with 40% from the United States and 10.5% from Germany. The British cement industry is fairly centralized and the tendency toward monopolistic organization is growing. The trend of the industry is southward, with one-half of the output now from the Thames and Medway districts. The recent census of production returns shows 84 establishments in operation.

At a time when many British industries are seriously depressed, British manufacture of cement is relatively prosperous. The two largest firms have maintained dividends at 10 to 15% in recent years. Issued share capital in the industry amounts to nearly £14,000,000. The home market, which is the main support of the industry, has developed well and would seem capable of further expansion. Consumption of 156 lb. per capita compares with about 480 lb. in the United States.

Increased Production

The preliminary report on cement in the 1930 British census of production shows an increasing output, meeting 94.5% of the home demand. Exports amount to about 20% of the cement produced. From 1924 to 1931 the average selling value fell about 30%, but improved methods have increased the per capita output of operatives.

British production of cement for building and engineering has increased 53% since 1924, the preceding census year. From 19,139,000 bbl. it advanced to 21,447,000 in 1925, 26,810,000 in 1928, and 29,448,000 in 1930. The report for 1925 and 1928 is based on figures from the *Investor's Chronicle and Money Market Review.* Production in 1931 has not yet been recorded.

Fluctuations in Foreign Trade

Figures for foreign trade do not show any general trend over the same interval. Imports in 1907 are recorded as 681,371 bbl., from which they rose to 1,295,470 in 1925 and 1,645,515 in 1928. In 1930 they were reported at 1,340,902 bbl., from which they dropped to 837,094 in 1931. The annual average over the entire period approximates 1,400,000 bbl., only about 4% of present production.

Exports were recorded at 4,553,103 bbl. in 1907, 4,143,834 in 1925, 5,423,327 in 1928, and 6,195,472 in 1930, from which they fell to 3,957,805 in 1931. Considerably more than half of the export goes regularly to countries in the British Empire, particularly the Irish Free State, British West and East Africa, and India. The important nonimperial buyers are the Netherlands, Egypt, Chile, Brazil, Argentina, and Persia. Exports to the United States, although comparatively small, have increased during the past several years, the highest annual shipments recorded being 199,600 bbl. in 1930. They consist largely of a rapid-hardening variety of cement.

Belgium is the predominant source of imported cement, contributing during the past five years an average of 77% of the total import each year, while the United States only averaged 30,000 bbl. a year.

British View of Export Difficulties

At the annual company meeting of one of the largest British cement producers, the chairman attributed the decreased export trade in 1931 to abnormal conditions, and stated that depreciation of the pound had not overcome these difficulties, although it helped to reduce imports. A further aid is the 10% import duty applying to cement since March 1, 1932. He further referred to the handicap facing British producers as the result of differences in freight rates from Great Britain and those from the Continent. He mentioned that while some of these difficulties have been overcome, the handicap remains in some quarters, especially in Central America and northern South America, where inadequate shipping facilities from London effectively eliminate the British exporter.

Monopolistic Tendency

The dominating "combine" in the British industry is the Blue Circle group, so called because of the trade name under which its product is sold. This group is composed of the Associated Portland Cement Manufacturers (Ltd.), created in 1900 by the amalgamation of 27 manufacturers, and its subsidiary company, the British Portland Cement Manufacturers (Ltd.), under the same direction, created in 1921 by the outright purchase of 21 businesses and a controlling interest in 11 others. These two companies maintain a joint selling organization, the Cement Marketing Co. (Ltd.). It is estimated that the Blue Circle group controls 75% of the total cement production of Great Britain.

Since the war, price cutting and competition by independent British producers have been severe. In 1926 a rival group appeared through the activities of the British Cement Products and Finance Co., which united several sound independent companies and organized a joint selling organization, marketing its products under the trade name Red Triangle. The aggregate capacity of this group approximated 6,000,000 bbl. a year; its deliveries during the past two years averaged 4,500,000 bbl. annually. A price war ensued and ended in 1928 by mutual agreement between the rival groups. This period of competition resulted in some technical improvements in manufacturing and the elimination of certain small firms and the establishment of somewhat larger units of production.

The Red Triangle combine was comparatively short-lived and went into the hands of a receiver in 1931. The Blue Circle group subsequently acquired all of the manufacturing interests of its rival, thus increasing its controlling position.

The recent annual report of the Blue Circle group was optimistic in tone and mentioned the more stable conditions which now may be anticipated in the domestic market as a result of the elimination of price-cutting. An agreement was reached in September, 1931, between the Blue Circle companies and independent manufacturers, fixing cement prices at what is considered a fair figure—on May 17, 1932, reported as £2 4 shillings 9 pence to £2 6 shillings 9 pence per ton for best portland cement, delivered London. According to the report, during the period 1925 to 1931, inclusive, cement prices fell 36% while production costs were reduced 28%. In 1931 the margin of profit on each ton was approximately half of that earned in 1925, but profits have been maintained by marketing a much increased tonnage.

Prices vary in different parts of the country, but averages worked out from a recent government survey of prices of building materials indicate a marked rise between 1914 and 1924, followed by a decline in recent years. It also shows that foreign cement regularly, throughout these years, has been sold considerably below the price for the domestic product, although the margin between domestic and foreign prices appears to have been less last year.

Pumicite That Needs Only Screening to Be Pulverized

By A. M. Luckey
Pasadena, Calif.

AT THE PRESENT TIME there is said to be only one known deposit in the United States where pumicite is found in a natural state so fine that it does not need grinding. This is the deposit on Fort Miller ranch, Fresno county, California. The deposit was discovered six years ago. The owner of the ranch was riding over the hills when he saw some ground squirrels coming out of their holes covered with a white powder. Examining the holes, he found that the squirrels had dug up a cream-colored material. He had it analyzed and found that it was pumicite, or rhyolite tuff, which every geologist knows is a solidified volcanic ash. When free and in a finely divided state, but of somewhat different geological genesis, tuff is no longer tuff, but is known as pumicite.

This mine is one of the most unique and remarkable mining properties on the Pacific coast. Hundreds of people visit it, and it is a matter of deep interest and wonder to every geologist and engineer who visits the region.

On the way to the mine I walked through a vast amphitheater 1½ miles in diameter. Bowl-like rims of granite, towering hundreds of feet above, completely surround it, except at the western end. Here the San Joaquin river, after cutting through the middle of the deposit, has dug its way to a bedrock level far below.

Mining Without Drilling or Blasting

Suddenly I turned a corner of the hill, and there was a dome with the openings to the mine shaped like cathedral windows. At the foot of the dome were the buildings, office and packing sheds.

The dome is honeycombed with tunnels, the walls soft, creamy tinted, and veined like marble. No timber is used, nor is powder necessary to break into the headings. At present hand labor is producing the needed tonnage from tunnels and wide cross-cuts, enough pillars of the pumicite being left to support the overburden.

Tests taken over 200 acres of this lake-basin deposit show that 98.8%—mine run—of this remarkable pumicite will pass a 325-mesh screen. No milling is required to prepare the commercial product. It is dug out with a pick, shoveled into wheelbarrows, and taken to a shed, where it is passed through a revolving cylinder. The lumps formed in digging are pulverized, on drying out, to a fine powder. The powder is sacked and loaded into trucks, and hauled three miles to the Southern Pacific terminal at Friant.

During the six years this mine has been in operation, thousands of feet of pumicite-cement concrete canal walls and floors have been poured by the half dozen irrigation districts which are using the material throughout the San Joaquin valley. One of the largest manufacturers of concrete pipe on the west coast is a steady consumer of the product. This company has its own sacking plant at the mine, and, like the irrigation districts, is displacing from 20 to 30% of the cement that would ordinarily be used with pumicite. The pumicite blend is said to give the pipe and other structures greater strength and waterproofness, and the concrete mixture increased workability and at the same time cuts the cost. A noticeable feature of the canal walls built with pumicite is the almost entire absence of cracks. The same is true in all the larger structures in which pumicite has been used.

E. C. Eaton, chief engineer of the Los Angeles Flood Control Board, in exhaustive tests with this pumicite made over a period of two years, found, among other things, that in mass construction the introduction of the volcanic dust caused a very material reduction in the setting temperature, a factor which no doubt accounts for the absence of cracking.

Compound of Silica and Alumina

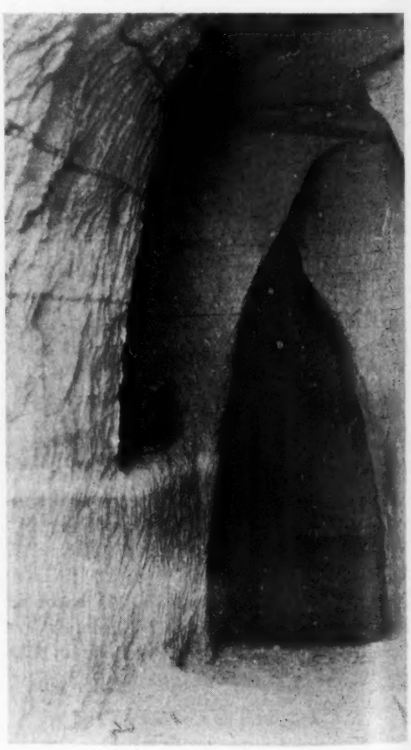
A chemical analysis of this pumicite shows 73% of silica and 15% of alumina as the main constituents. Ignition loss runs to 4.17%.*

The deposit on Fort Miller ranch was preserved for mankind by a lake which, fortunately for the present generation and unfortunately for its own watery content, stood in the way of a hurricane of volcanic dust. The dust winds continued over an indefinite time, finally filling the entire lake basin. The water, forced over the lower rims, carried with it some of the accumulated material. As this was swept out it was redeposited along the western edges, where, mixed with detrital matter, it now lies a recrystallized, hardened product.

The main body of this pumicite, covering some 200 acres, remains practically intact. This has suffered only slightly from erosion, due to its protecting shell. The latter is about 4 ft. in thickness and is the pumicite itself metamorphosed into a hard, rocklike stratum (tuff) through the contributing agencies of meteoric waters and perhaps some organic matter. The area covered by the deposit will yield eventually a total approximating 15,000,000 tons from the three domes in which it lies and whose heights range from 50 to 90 ft. Due to the fact that the deposit is clean throughout, entirely free of any foreign substances, mining on a large scale will be started soon through a slicing method with power shovels—a horizontal layer will be cut off near the summit of a dome, and this operation repeated from suc-

*This chemical analysis of pumicite is taken, by permission of the publishers, from *The Mining Journal*.

No blasting is required



Showing how the material is mined

Another view in one of the tunnels

cessive benches cut into the dome at lower levels.

Now that extensive markets have been established, mining will be continued on a comprehensive scale.

Recording Efficiency of Concrete Mixing by Wattmeter

AN INTERESTING use of a graphic wattmeter as a check on the mixing time of a concrete mixer and the progress of the pour is described by Ira A. Butcher in a recent issue of *Engineering News-Record*. It was used in the construction of a water filtration plant at Hull, Quebec.

A recording wattmeter, located in the plant office, was connected with the motor of the mixer so that the chart gave a complete record of the mixing operation, showing the mixing time or number of batches per hour, the number and duration of delays, and whether the delays were in charging or discharging.

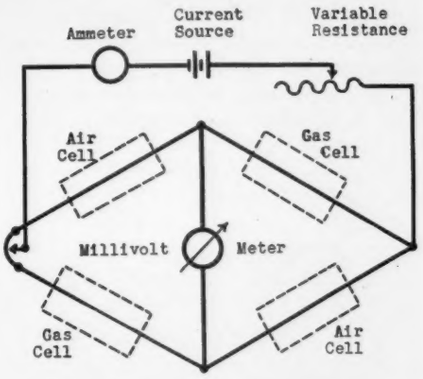
It also indicated any change in conditions as to the amount of water or materials in the mix and would seem to offer possibilities as a means of checking the consistency of the concrete.

Continuous Waste Gas Analyzer for Cement Kilns

A METHOD of improving combustion control in cement kilns through the use of electrical apparatus for analyzing the exit gases is described in a pamphlet recently published by F. L. Smidth and Co., New York.

The apparatus consists of a sampling device located in the dust chamber, an analyzing cabinet located near the dust chamber, indicating meters on the burner's platform, and a graphic recording meter in the office of the chemist or superintendent. The analyzing cabinet contains a cooling condenser, filters, CO_2 analyzer and $CO + H_2$ analyzer, through which the gas is drawn continuously. It is stated that this type of electrical analyzer is superior to the chemical or mechanical types.

The CO_2 analyzer operates on the principle that if a platinum wire in a metal tube or gas cell through which the exit gases are passed is heated by an electric current of constant value, the temperature and ohmic resistance of the wire will vary until the heat generated in the wire equals the heat carried away by the gases. The ohmic resistance is not measured directly but is compared, by means of a Wheatstone bridge, with the resistance of an identical wire in a metal tube filled with air. The operation is based on the fact that the heat conductivity

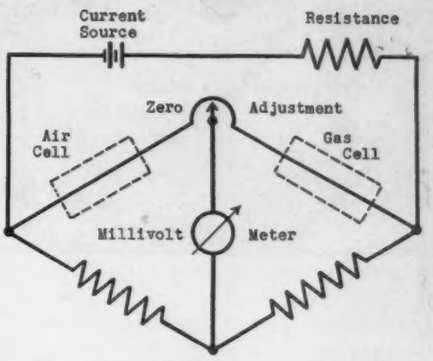


Method used in CO_2 analyzer

of air (oxygen and nitrogen) and carbon monoxide is about the same, but almost twice that of carbon dioxide, the resistance of the wire varying directly with the percentage of CO_2 in the gases passing through the analyzing tube.

The $CO + H_2$ analyzer operates on an entirely different principle, that of the heat generated by the complete combustion of the unburned combustibles in the exit gases. The ignition is caused by a platinum wire heated by a constant electric current and is accomplished at a low temperature conducive to long life of the wire because of the catalytic action of the platinum wire. The heat generated by the combustion raises the temperature and ohmic resistance of the wire in direct proportion to the amount of combustibles. This analyzer is more sensitive, due to the considerable temperature rise with even the smallest amount of combustibles, so that the simpler arrangement of Wheatstone bridge is used.

The low voltage direct current used in the analyzers is obtained from rectifying units. The indicating meters enable the kiln operator to regulate for the correct amount of air,



Method used in $CO + H_2$ analyzer

while the charts of the graphic meter give a record of performance. Substantial fuel savings and more uniform operation are claimed with these instruments.

Water Softening With Both Lime and Zeolite

BOTH the lime and zeolite methods of water softening are used in combination at the new municipal waterworks plant at Findlay, Ohio, according to a recent article in *Engineering News-Record* describing the plant which was put into operation in October, 1931.

The water, which is normally obtained from wells and is quite hard, is first treated with lime to reduce the hardness as low as possible. Then half of the lime-softened water is passed through zeolite filters and completely softened and the two products are mixed to obtain the desired softness.

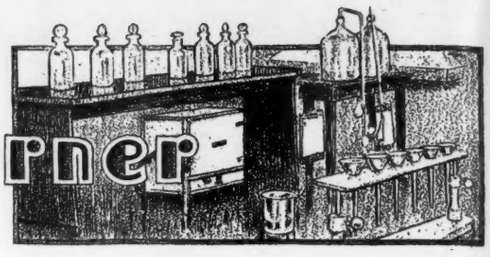
The raw water is passed through a meter which by means of electrical connections controls the amount of lime added. After being clarified and filtered through a battery of rapid sand filters, part of the water is passed through three zeolite filters. These are similar to the sand filters except that zeolite is used instead of sand.

The quicklime is received in box cars and unloaded to one of two 30 ton bins. Below each bin the lime is weighed, slaked and fed in proportion to the amount of water being treated. Salt used for the brine for regenerating the zeolite filters is unloaded from railroad cars to bins alongside the track. These are kept filled with water and the brine is drawn off and circulated by a small centrifugal pump. Coke is used for heating in the winter and to provide CO_2 gas for the carbonation and recarbonation chambers, the gases being washed and compressed.

Bibliography of Vibration of Shafts

THE engineering literature of the past 30 years relating to vibration in shafts is listed in a very complete bibliography published by Purdue University, Lafayette, Ind., as Research Series No. 39.

The Chemists' Corner



What Is the Essential Flour in Cement

By S. Rordam

Central Testing Laboratory, Cowham System Mills, Chattanooga, Tenn.

IN HIS ARTICLE "Notes on the Determination of Flour in Cement," published in Rock Products, April 9, 1932, Mr. Eduardo Taylor assumes that the important flour in cement is the material ranging in grain size from 10μ to 25μ. This is based on the opinion of Wright.[1]

Pearson and Sligh[2] consider the material finer than 25μ as flour.

The Associated Portland Cement Manufacturers, Ltd., England, have adopted a standard elutriator to determine the "standard flour"[3] in cement. The material removed by an air current having a velocity of 21 ft. per min. is considered as flour. This flour has an average particle size of 10μ. [This was also noted in the same issue of Rock Products.—The Editors.]

Helbig[4] points out that the strength, and especially the early strength, of a cement increases with increasing fineness. He contends that there is no defined limit of fineness beyond which the strength begins to fall off. The imperviousness of the concrete made with the cement has also a direct relation to the amount of very fine flour in the cement.

Helbig's views are not shared by Kühl[5] who is of the opinion that extreme fineness may cause a lowering of the strength.

Kühl[6] has conducted an extensive study of air-separated fractions of cement. Using a von Gonell separator he split a cement up into seven fractions, each fraction differing from the next in grain diameter by 10μ. The individual fractions were tested for tensile and compressive strengths of 1:3 mortar by the miniature testing method developed by Kühl.[7]

His test results led him to the conclusion that a cement having uniform grain size of about 30μ would have about the same strength as the original cement, and would require less power to grind on account of the lesser "inner surface." By reducing the grain size to 15-20μ the strength would be increased considerably above that of the original cement, and it should still be within the limits of economical production to make such a cement. It would be entirely uneconomical to make a cement finer than 10μ. The power consumption for the grinding would be beyond all reason, and the strength of such a fine cement would not be improved to any marked degree.

The tests upon which Kühl bases his conclusions, however, do not readily give a reliable picture of the concreting values of the various cement fractions.

It has been shown by several investigators that the standard tests for tensile and compressive strengths of a 1:3 mortar are not really reliable criterions of how the cement is going to act when used in concrete, and when dealing with a cement having a granulometric composition, quite different from that of ordinary cement, this uncertainty of testing methods becomes very pronounced.

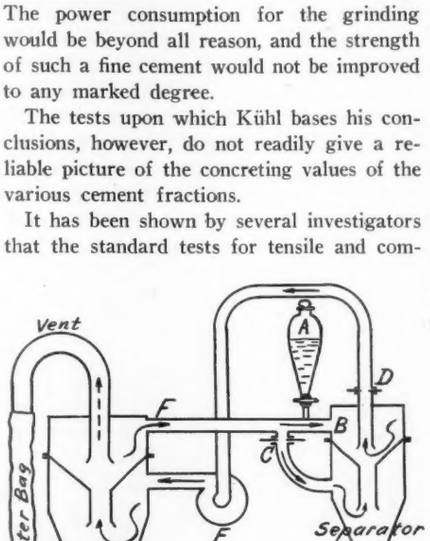


Fig. 1. Laboratory equipment used

Furthermore, this type of testing completely fails to give any information concerning the plastic quality of the cement, a feature equally as important as strength when gaging the concreting value of a cement.

Experience has taught us that if a cement of a granulometric composition as obtained by our present grinding methods satisfies certain standard tests, it is reasonably certain that it will produce a concrete of satisfactory nature and durability. But if the granulometric composition of the cement is entirely changed, then the standard tests will fail to have any true significance. Although the specially graded cement may satisfy the present standard tests in a seemingly acceptable manner, the concrete made with the cement in question may not be satisfactory. The test results obtained with a cement graded 10-25μ, given later in this paper, furnish a good example of how a cement having a good strength may lack the properties essential for making a good concrete.

The definition of what may be considered the "essential flour" in cement has always been rather vague, and it must necessarily remain so unless it can be proved by actual tests that the really important qualities of a cement can be referred to some particular interval of grading.

Leaving out all considerations of a chemical nature, the two most important qualities of cement may be said to be the power to confer plastic workability on the concrete mix, and the bonding strength developed by the cement. If it can be proved that these two qualities are prevalent in a particular interval of grading, one would have a ready answer to the question, "What is the essential flour in cement?"

The writer has done considerable work on fractionated air-separation of cement and in his opinion it is the cement finer than 10μ which is the really important material. Early strength is largely determined by the content of flour finer than 10μ, and the important quality of plasticity and the power to "hold" the water in the freshly made concrete mix is almost entirely determined by the material finer than 10μ.

This statement is confirmed by the experiments on air-separated cement carried out by Jennings.[8] Using an air-separator similar to the one used by the writer, Jennings separated an ordinary portland cement into various fractions and tested the chemical and physical qualities of the cements so obtained. The tests made by the writer were all completed before he read the paper by Jennings. It is gratifying to note how close an agreement there is in the analytical re-

sults obtained. The strength tests made by Jennings were unfortunately made on fractions separated from a cement containing added gypsum, so the amounts of SO_3 in his samples vary considerably. This introduces a factor of uncertainty in the tests for strength, as an increasing content of gypsum has a distinct influence on the early strength of the cement.

The tests carried out by the writer on air-separated samples of cement are described in what follows. A Federal laboratory air separator was used as shown in Fig. 1, the unit consisting of a separator and collector. The cement is introduced through the funnel *A* and carries it into the separator at *B*. In the separator the centrifugal force throws the cement out against the wall where it drops down through the inner cone. In the cylindrical extension of this cone the whirling cement meets an opposing air current blowing upwards and whirling against the cement. The "mesh diaphragm" at *C* controls the velocity of this opposing air current, which again determines the size of the material carried out of the separator. The coarse material drops into the flask for rejects. The fine dust carried out of the separator at *D* passes through the fan *E* and is blown into the collector. Here the dust is thrown out of the air current by centrifugal force, and falls into the flask at the bottom of the collector. The air current returns to the separator through *F*. A small amount of very fine dust escapes through the vent pipe. It is caught in the filter bag and collected in a beaker at the end of the bag, *H*.

During the preliminary work with the separator it was found necessary to alter the original feeding device and replace it with a separatory funnel of glass so as to have an air-tight system of feeding the cement into the separator. The original feeder allowed too much air to leak into the system, and made it impossible to get a clean and sharp separation. Prior to the main tests, the separator was calibrated by determining the diaphragm combination which would give the desired fineness of separated material, and by a long series of repeated tests a satisfactory working technique was established.

It was found that the separation of the cement was easiest with the finest material up to a grain size of about 25μ. It was much more difficult to get a sharp separation of the material coarser than 25μ, as the relatively high air velocity in the separator tends to carry over much oversize. By combining the air-separation of the coarser material with a special sieving on an inclined 200-mesh sieve, it was, however, possible to get a very fair separation of the two fractions graded 25-50μ and coarser than 50μ.

For all preliminary tests, which aimed at establishing the best working technique, a sample of regular portland cement was used. This cement was ground in a 7x26-ft. compeb mill to a fineness of 13% retained on the 200-mesh sieve. Repeated tests, with a very satisfactory agreement, gave the following granulometric composition of the cement:

17%	plus 50μ
33%	25-50μ
27%	10-25μ
23%	0-10μ

In calibrating for particle size, one has to bear in mind that the grains are not of a uniform shape. The upper size limit of a particular fraction is therefore not determined by simply measuring what appears to be the largest particles. If all the cement grains were cubes or spheres, it would be a simple matter to determine the range of the grading. But a large number of the particles are flat or elongated, and may look like oversize material. For example, if a cube with sides of 25μ is compressed so that one dimension is reduced to one-half of what it was, the ensuing particle will be a flat prism measuring 12.5 x 35 x 35μ. In the miscroscope it will appear as a grain with a diameter of 35μ, but it is a perfectly legitimate particle in a grading having an upper size limit of 25μ. And it is a more reactive grain than a cubic particle, as its surface is 13% greater than that of the cube. In measuring the grain size of a fraction it is therefore necessary to pay close attention to the shape of the particles until the eye learns to judge the particle size representing the true upper limit of the grading.

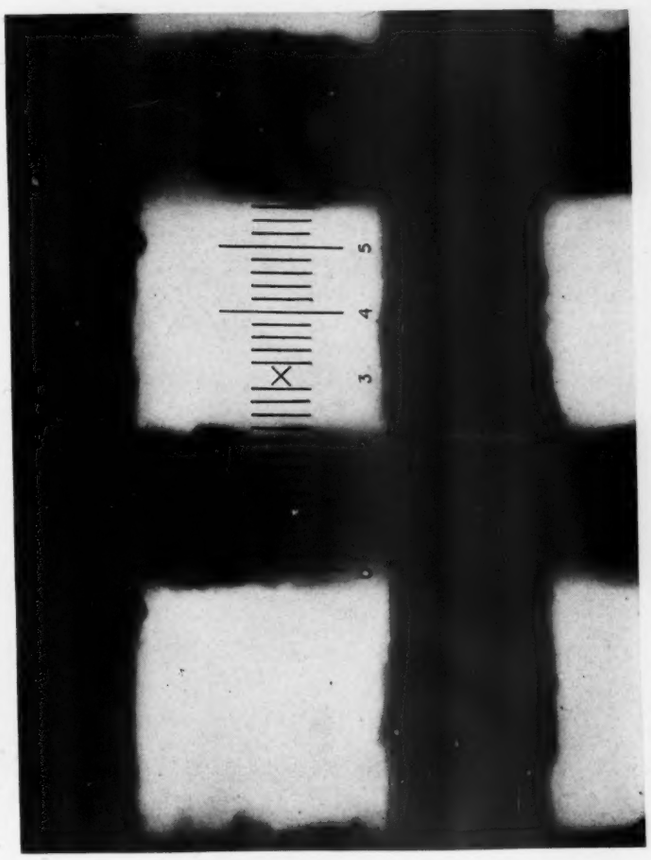


Fig. 2. 200-mesh sieve magnified to the same degree as the cement fractions

Fig. 2 is a microphotograph of a 200-mesh testing sieve and Figs. 3 to 5 are photographs of the air-separated cement fractions from the main test. All are magnified to the same degree, about 425 times actual size. On each photograph will be seen an imprint of the eyepiece micrometer in the microscope. With the lens combination used for the photographs, each division of the eyepiece micrometer is equal to 4.18μ.

A 200-mesh sieve has a nominal mesh opening of 74μ. By comparing the mesh opening with the grain diameters of the finer sizes, one gets a very striking idea of how little relation there is between a fineness test on a 200-mesh sieve and the fineness of the particles forming the really active part of the cement. This uncertainty of the fineness test on the 200-mesh sieve as a guide to the flour content is even more pronounced with air-separators in closed-circuit with the grinding mills.

The test for "standard flour" adopted by the Associated Portland Cement Manufacturers, Ltd., England, is a long step forward, but it seems to the writer that the interval of grading represented by "an average particle size of 10μ" is too large to give also a reliable measure of the amount of material finer than 10μ.

Grading and Distribution of Gypsum in Cement

Owing to the easy grindability of gypsum and to its lower specific gravity as compared with cement clinker, it was to be expected that most of the gypsum would be found in the finest of the air-separated fractions. A sample of regular cement was split up into four fractions and each fraction tested for SO_3 content, with the results shown in Table I.

TABLE I—TEST OF SEPARATED FRACTIONS FOR SO_3

Original cement: 1.48% SO_3

Grading	Quantity	SO_3 in fraction	SO_3 contrib. by each fraction
Residue on 200-mesh (over 74μ)	11.2%	0.27%	0.03%
25-74μ	43.0	0.30	0.13
10-25μ	23.2	1.01	0.23
Under 10μ	21.6	4.60	0.99
Dust in filter bag	1.0	10.70	0.11
Total			1.49% SO_3

It will be noted that the material coarser than 25μ contains only SO_3 derived from the clinker. Practically all the gypsum is concentrated in the material finer than 10μ. The very fine dust in the filter bag contained 10.7% SO_3, or about 25 %gypsum.

The uneven distribution of gypsum in the air-separated fractions makes it impossible to use these fractions for comparative strength tests. Such tests must be carried out on clinker which is ground without the addition of gypsum. Following the air-separation, the individual fractions are then mixed with an equal amount of very fine air-separated gypsum. Only in this way is it possible to obtain comparable results.

The following example shows the importance of having the gypsum of a sufficient fineness. When it came to determining the amount of gypsum required for regulating the setting time of the cement fraction graded 0-10μ, a small quantity of seemingly fine gypsum was prepared by a quick shaking of some ground gypsum through a 325-mesh sieve. This sifted gypsum was added to a batch of the fine cement in the amount of 4% and the two materials were mixed carefully by being brushed several times through a 200-mesh sieve. A 50-gram pat was made up, using 41% water for obtaining a consistency resembling the normal consistency of regular cement. The pat had a typical "grab set." The initial set (with Gilmore needle) was practically completed after 4 min., but it was not quite completed before 14 min. At 17 min. the pat commenced to heat up, and final set had taken place after 25 min. Another portion of the fine cement was then mixed with 4% of very fine gypsum, which had been air-separated so that at least 80% of it was finer than 15μ. A pat of this cement was made up, using the same amount of water as in the previous test. This cement behaved quite normally. It had an initial setting time of 1 hr., and a final set of 6 hr. No abnormal heating was noticed. This shows how important it is that the gypsum be sufficiently fine.

Main Separation and Tests

For the main separation tests to determine the range of grading which has the essential concreting value, a batch of clinker from a rotary kiln was ground in a laboratory mill to a fineness of 7% retained on the 200-mesh sieve. About 40 lb. (18,000 grams) of this cement was air-separated into four fractions, the gradation being:

14.7%	plus 50μ
31.2%	25-50μ
29.1%	10-25μ
25.0%	0-10μ

The separations were carried out by using 500 grams of cement at a time, and repeating the passing of the cement through the separator until practically constant weight of rejects. In general it took about 30 passes through the separator to reach constant weight. The progress of the separation was followed closely with the microscope.

The total of all dust losses for this whole series of separations amounted to 277 grams out of the 18,000 grams treated, equal to a total loss of 1.5%. A close check was kept on the progressive increase of the losses, and as it was evident that the lost material was evenly distributed over the whole range of gradations, it was disregarded in calculating the percentages of the various fractions. Some 2000 separations were necessary to obtain the above four fractions. The average dust loss during each run through the separator is therefore less than 0.15 grm.

The original cement and the four air-separated fractions were tested for chemical composition which is given in Table II.

It is interesting to study the gradual changes in the composition of the fractions. The coarsest material, representing the material hardest to grind, contains less lime and more silica than the finer fractions. The outer part of the clinker nodules, contaminated with absorbed coal ash, and residual sand grains in the clinker, are presumably hardest to grind. The center of the clinker, which is less contaminated, and therefore higher in lime, is softer and easier to grind.

Physical Tests

The four separated cement fractions, and also the original cement, were all given an addition of 4% gypsum. The gypsum was air-separated so that all of it was finer than 25μ, and it was judged that about 80% of it was finer than 15μ. The amount of SO_3 in the ensuing cements was 1.6% throughout.

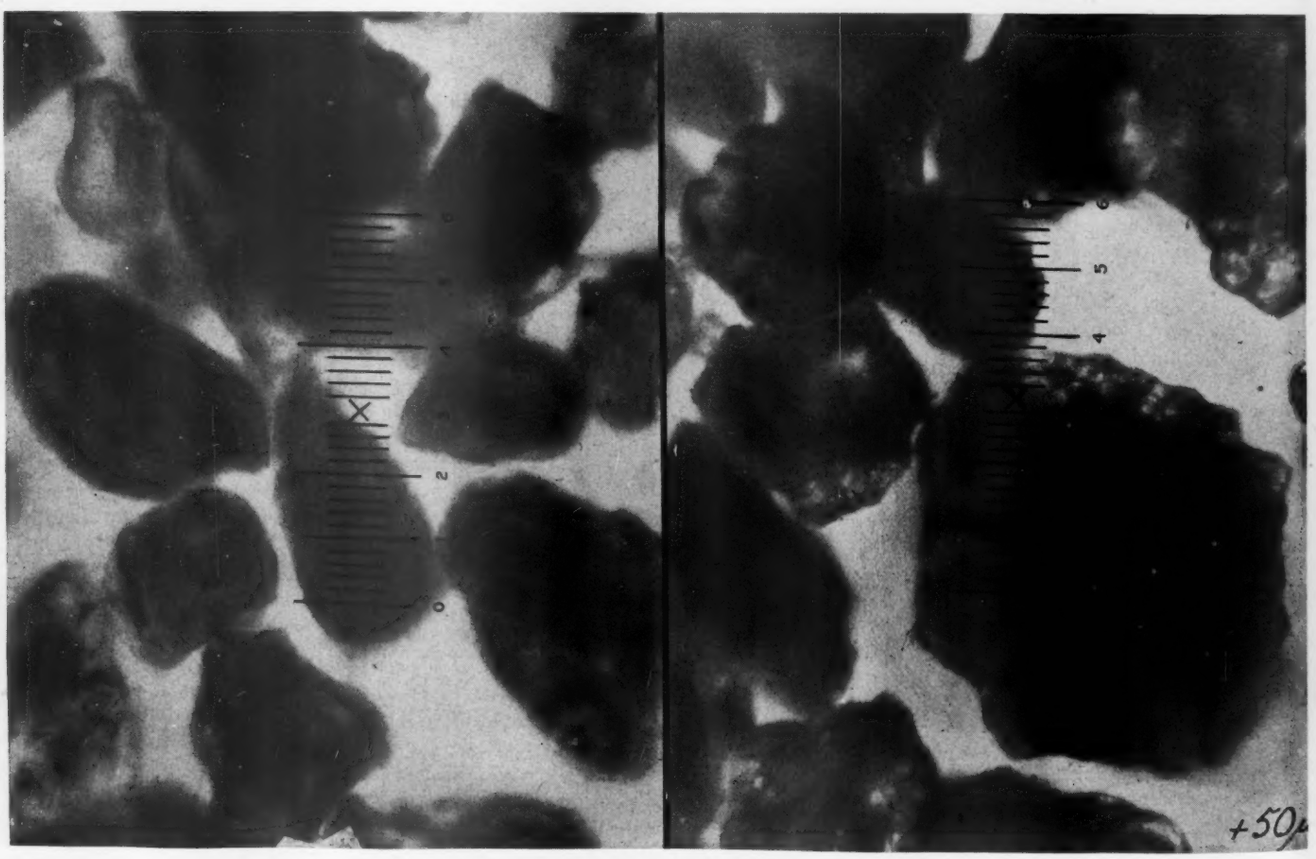


Fig. 3. Fraction coarser than 50 microns. Cement ground to 80-90% minus 200-mesh contains 20-25% of this grading

The samples were tested for setting time, soundness on boiling and tensile strength of 1:3 Ottawa standard sand mortar according to the A.S.T.M. specifications for testing of portland cement (Table III). In addition, a series of 3x6-in. concrete cylinders were also prepared. For the concrete tests a uniform water-cement ratio was maintained, amounting to 7½ U. S. gal. of water per bag of cement (94 lb.). Based on the weight of dry cement, the amount of water used was 66.5%.

The original cement required 24% of water for normal consistency of the neat cement paste. The fraction graded 0-10μ required 41% water for a similar consistency. The paste of this fine cement was extremely fat and sticky.

The fractions coarser than 10μ were all made up with the same amount of water as used for the original cement. When mixed with water the three cements coarser than 10μ lacked all plasticity. Under the trowel they worked just like fine wet sand. While being mixed, the paste of these cements would seem rather dry and crumbly, but when the paste was formed into a pat on a glass plate, the pat would go quite limp, and after a short while a large amount of water would exude. A similar feature was observed in the mortars and concretes made with these cements.

The two cements of grain sizes 25-50μ and coarser than 50μ had no definite setting

TABLE II—CHEMICAL COMPOSITIONS OF FRACTIONS

	Original cement	Fractions			
		Over 50μ	25-50μ	10-25μ	0-10μ
SiO_2	21.5%	22.7	22.3	22.1	20.4
Al_2O_3	5.7	6.0	5.6	5.5	5.8
Fe_2O_3	2.5	2.7	2.5	2.5	2.5
CaO	64.6	63.9	64.8	65.4	64.3
MgO	3.6	3.7	3.8	3.5	3.5
Loss on ignition	1.9	0.4	0.4	0.7	3.3
Calculated on no loss on ignition basis the analyses would be:					
SiO_2	21.9	22.8	22.4	22.3	21.1
Al_2O_3	5.8	6.1	5.6	5.5	6.0
Fe_2O_3	2.6	2.7	2.6	2.5	2.5
CaO	65.9	64.2	65.0	65.9	66.5
MgO	3.7	3.7	3.8	3.5	3.6

TABLE III—TESTS ACCORDING TO A.S.T.M. SPECIFICATIONS

	Original cement	Fraction 10-25μ	Fraction 0-10μ
Initial setting time	3:00	7:00	1:00
Final setting time (Gilmore needle)	4:40	11:00	6:00
Boiling test	Sound	Sound	Sound
Tensile strength (1:3 Ottawa sand briquettes stored 1 day in moist air, then in water of 70 deg. F.)			
Water used, in % of dry mortar	10.5%	10.5%	13.4%
1 day	121 lb. sq. in.	40 lb. sq. in.	218 lb. sq. in.
3 days	227	181	420
7 days	311	294	443
28 days	432	450	478
90 days	459	515	481
1 year	338	428	440

times. After about three days storage in a moist closet, a carbonated surface film commenced to form on top of the pats. After two weeks storage in the moist closet a surface crust had formed, but underneath this crust the material was still wet and crumbly. After a sufficiently long period the material coarser than 25μ will develop a certain bonding strength, but it contributes next to nothing to the strength of the concrete during the first month following placing of concrete.

The cement fraction graded 10-25μ had a fairly well defined setting time, but lacked plasticity to a marked degree. It will be seen later that this cement produced a harsh concrete having a high water segregation.

The fraction graded 0-10μ had a well defined setting time. The cement paste had the consistency of butter. The neat paste of this fine fraction developed shrinkage cracks be-

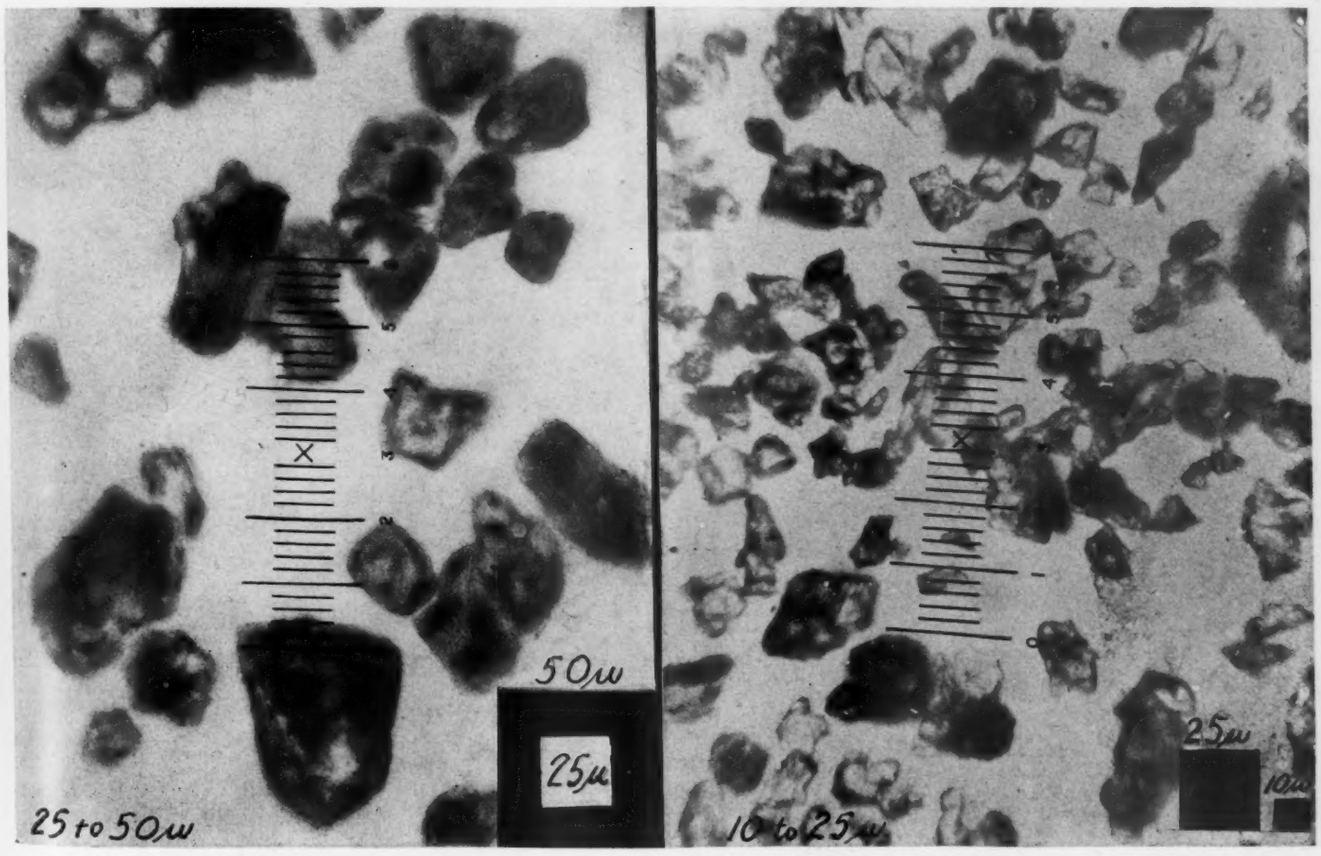


Fig. 4. At left, 25- to 50-micron material. Cement of ordinary fineness contains 20-30% of this grading. At right, 10- to 25-micron material. Cement of ordinary fineness contains 25-30% of this grading

fore final set had taken place, although the cement pat was kept in an atmosphere of 100% humidity. No unusual shrinkage was noted when the fine cement was used in concrete, but it stands to reason that a cement of this type will produce a higher initial shrinkage of concrete than would cement of usual fineness.

The fresh concrete made with this fine cement was very plastic and workable, and there was no trace of water segregation. About 5 min. after being made up this concrete had a considerable initial stiffening, as the water was absorbed by the swelling cement particles, but no unusual heating was observed.

Three briquettes were tested for each period. No briquettes were made up of the two coarsest fractions, as the water segregation from the mortar was judged to render the ensuing test results unfit for comparisons.

The retrogression in strength of the 1 year old briquettes is not indicative of a true deterioration, as it is a fairly common phenomenon with briquettes older than 90 days.

Judged by the above values for tensile strengths, there should be no very great difference in the strengths of the three cements. Even the very fine cement is not so very much ahead of the original cement. This agrees with the conclusions arrived at by Professor Kühl, but we get an entirely different picture when the cements are tested in concrete (Table IV).

TABLE IV—TESTS IN CONCRETE

Compressive strengths of concrete in lb. per sq. in. Water-cement ratio equal to 7½ U. S. gal. per 94 lb. cement (66.5% water by weight of cement). 3x6-in. cylinders, cured in moist air at 70 deg. F. Two cylinders tested at each period.

Age of cylinder	Original cement	Fraction 10-25μ	Fraction 0-10μ
1 day	234	206	1000
3 days	1047	906	3430
7 days	1948	1965	4000
28 days	2960	3410	4200
90 days	3950	4140	4530
1 year	5080	5110	5450

The aggregates used for the concrete mixes were clean well graded river sand and graded ¼-in. to ¾-in. gravel. The proportioning of the mixes is given on a volume basis to conform with usual practice, but the actual proportioning was done by weighing the individual materials. In adding water to the concrete mixes, due allowance was made for the water absorbed by the room-dry aggregates. The cement weighed 94 lb. per cu. ft.; the sand, 103 lb. per cu. ft.; and the gravel, 100 lb. per cu. ft.

The weight per cu. ft. of the different cement fractions was assumed to be the same (94 lb.). In actual practice there is of course a very considerable difference in the bulking of the various fractions.

Discussion of Concrete Mixes

Original Cement—The concrete made with the original cement was proportioned 1:2.5:3.3 by dry rodded volumes. The slump of this concrete was 1½-in. and the workability excellent. Water segregation from the mix was almost nil.

Cement 0-10μ—This fine cement was first tried in a small batch of concrete having the same composition as the mix for the original cement. But as this mix was very stiff and difficult to work the ratio between the sand and gravel was altered so that the final mix contained less sand and more gravel. The mix from which the concrete cylinders were made up was proportioned: 1:2.2:3.6 by dry rodded volumes. The slump was about 1-in. and the plastic workability of the fresh mix was very good. After about 5 min. an initial stiffening was observed. The concrete had been placed in the test cylinders when this stiffening took place, so it did not interfere with the quality of the concrete cylinders, but in actual practice this stiffening would have caused difficulty.

Cement 10-25μ—The cement graded 10-25μ was first tried in a concrete mix of the same proportions as used for the original cement, but the ensuing concrete was very harsh and quite sloppy. There was no coherence between coarse and fine aggregate. More sand was added to improve the workability of the mix. The final mix with this cement was oversanded judged by ordinary standards, but it was found necessary to use an excess of sand to reduce the water segregation. The concrete from which the test cylinders were prepared was proportioned: 1:2.8:3.3 by dry rodded volumes. The slump was about 3 in.

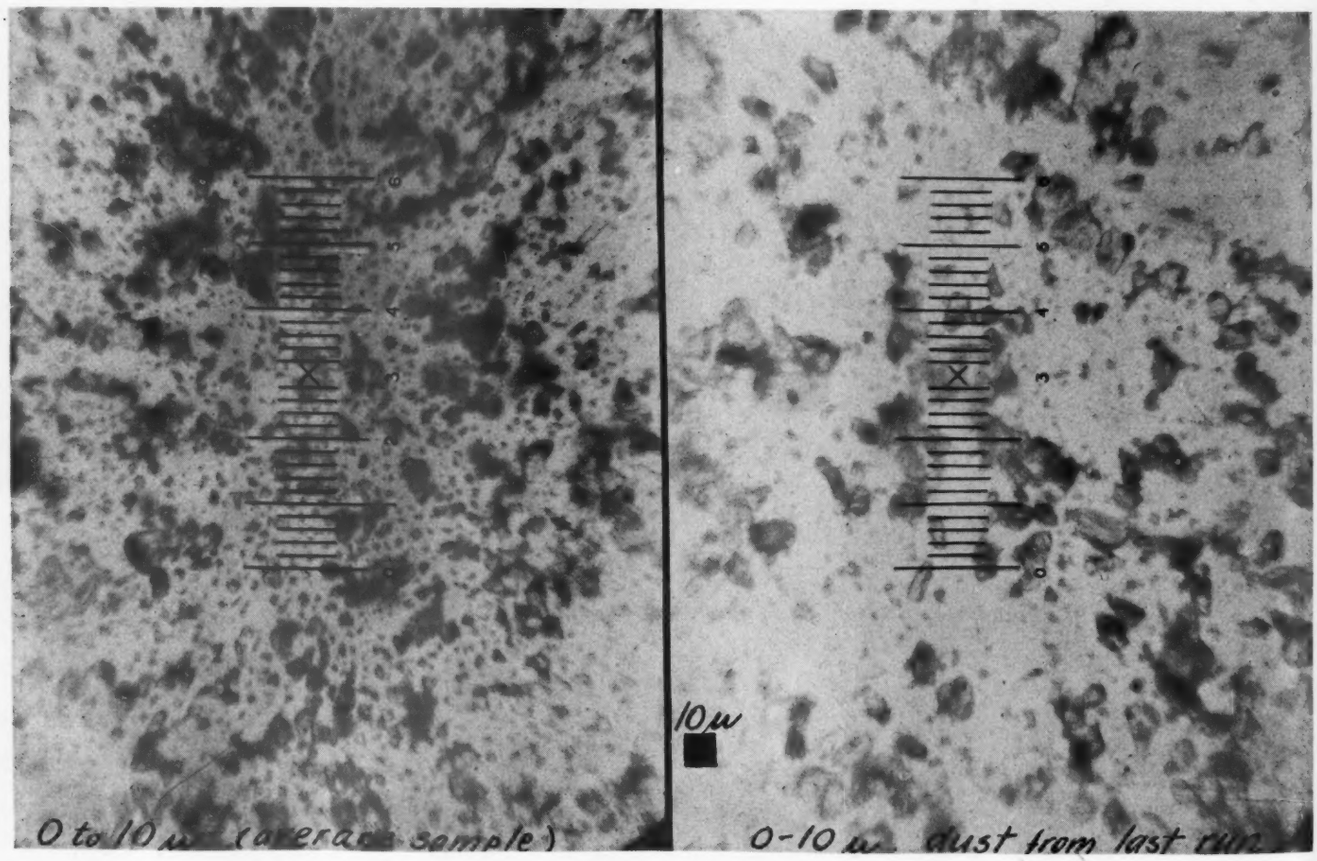


Fig. 5. At left, average sample of 0- to 10-micron fraction. At right, dust recovered from final run of separator of material finer than 10 microns. Cement of ordinary fineness contains 20-25% of this grading

It was a concrete of poor workability, and under practical working conditions it would have been very difficult, if not impossible, to place without the formation of stone pockets and honeycombed patches. In spite of all precautions a considerable amount of water exuded from the mix.

Cements Coarser Than 25μ—The two fractions coarser than 25μ were tried in concrete mixes, but mixes were not much different from a plain wet mixture of sand and gravel. The water segregation was so excessive that it would have been impossible to obtain strength tests of any value. For this reason no specific tests were made to determine the bonding strength of the material coarser than 25μ. During the first several weeks life of the concrete this coarse material is nothing but an inert filler. At later ages the coarse grains contribute in a small way to the compressive strength of the concrete.

It is the material finer than 10μ which to begin with must carry the dead weight of the coarser material and it is this fine flour which is responsible for the plastic workability of the concrete mix, without which quality it would not be possible to make an impervious and durable concrete.

The early hardening power of the concrete is likewise determined by the material finer than 10μ. At the age of 7 days this material has developed a concrete strength which is about 78% of the strength developed by the original cement after one year.

If strength alone were considered, one might say that the material finer than 25μ represented the flour in the cement. But it is the material finer than 10μ which *alone* contains the two essential qualities of *strength* and *plasticity*. It is this material which forms the "back-bone" of the cement, and should be termed *the essential flour*.

Tests With Mixed Cements

In addition to the tests on the separated fractions of the cement, two series of tests were made on cements mixed to a predetermined grading. The object of these tests was to gain an idea of the quality improvement which might be expected by a perfected air-separation on a large scale. The granulometric compositions of these two mixed cements and of the original cement, and a partial analysis of a commercial high-early strength cement are given in Table V.

Cement A—This cement is supposed to represent an air-separated cement having only a trace of residue on the 325-mesh sieve. To obtain such a cement it would be necessary to reject and regrind 20 to 25% of a cement ground to ordinary fineness.

Cement B—This is a cement in which everything coarser than 25μ has been removed. This would mean that about 50% of an ordinary cement would have to be rejected and reground.

In proportioning the above two mixtures, due consideration has been given to the fact that a closed-circuit grinding system, consisting of a mill of the present-day type coupled to a single-action cyclonic separator,

TABLE V—GRANULOMETRIC COMPOSITIONS OF CEMENTS

	Original cement	Cement A	Cement B	High-early strength cement
Fineness on 200-mesh (amount retained)	7.0%	0	0	3.2%
Granulometric composition:				
Over 50μ	14.7%	nil	nil	not determined
25-50μ	31.2	42%	nil	not determined
10-25μ	29.1	36	60%	not determined
0-10μ	25.0	22	40	45%

TABLE VI—TESTS OF MIXED CEMENTS IN CONCRETE

Compressive strengths of concretes in lb. per sq. in.
Water-cement ratio equal to 7½ gal. per 94 lb. cement (66.5% water by weight of dry cement).

Age of cylinder	Original cement	Cement A	Cement B	High-early strength cement
1 day	234	262	474	1025
3 days	1047	1228	2080	2100
7 days	1948	2050	3000	2400
28 days	2960	3200	3950	3000
90 days	3950	.....	.....	3200

will produce less of the very finest material than one would expect by simply calculating the probable composition of the separated cement on the basis of the granulometric composition of the cement produced when the mill is grinding without air-separator.

Both of the mixed cements were given an addition of 4% air-separated gypsum. The setting times of both cements were quite normal, and about the same as that of the original cement.

The available amount of the two mixed cements was only sufficient for concrete cylinders up to an age of 28 days. No briquettes for tensile tests were made. Both cements were tested in concrete mixes having the same water-cement ratio as used for previous concrete tests. The mix proportioning was 1:2.6:3.6 by dry rodded volumes.

Cement A had practically the same mix characteristics as the original cement. The concrete made with Cement B had a very superior plasticity; it was judged to be even better than that of the concrete made with the finely ground high-early strength cement. Cement B did not show any objectionable initial stiffening.

These tests would seem to indicate that a very considerable amount of air-separation and regrinding would be required to produce any marked increase in the concrete strength and might also indicate that air-separation should not be looked upon as a very efficient means towards strength improvement. But when air-separation is applied correctly, it should show considerable saving in the cost of the grinding operation.

In the March, 1932, issue of *Cement & Cement Manufacture* is published a paper by Helbig, "Multi-chamber Mills With Air Separation for Superfine Cement." The writer considers this a valuable and constructive discussion of the present-day problems of cement grinding. Helbig advocates a system of cement grinding consisting of a preliminary grinder in closed-circuit with a vibrating screen, and a finishing mill in closed-circuit with an air-separator. When correctly designed, such a system should offer a solution to many of the present-day grinding difficulties.

Air separators in closed-circuit with finishing mills for cement have been in use for several years, but opinions differ somewhat as to the merits of this system. It would seem much of the criticism against this system is based on unsatisfactory results obtained with installations not designed to take full advantage of the inherent possibilities of the closed-circuit grinding. Several of the air-separators in use for cement grinding have been installed as an afterthought and are coupled to grinding mills designed for open-circuit grinding. Such a mill will not have maximum efficiency when handling the much larger load used in the closed-circuit system.

Another drawback to this method of grinding is the relatively low efficiency of the single-action cyclonic separator. The problems of an efficient air-separation, which would produce two fractions, one containing, say, 95% of all material finer than 25μ, and the other 95% of all coarser material, are very similar to the problems of fractionated distillation of two liquids having boiling points close together (alcohol-water). The efficient separation by distillation of alcohol and water is only possible by using a multiple action distillation column. In a similar manner the efficient air-separation of cement is undoubtedly predicated on the design of a multiple-stage separator. The cement would flow through this separator only once, but while passing through it would be exposed to numerous separation stages, each mild in action, and removing only a part of the desired fine material. The sum total of the work performed would be an almost quantitative separation.

In concluding, I wish to express my appreciation of the help given me by A. T. Harwood, chief chemist, Florida Portland Cement Co., Tampa, Fla., who has conducted all chemical tests, and J. E. Tonetti, Signal Mountain Portland Cement Co., Chattanooga, Tenn., who has assisted me with the air separations.

References:

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(2) Pearson and Sligh, Bureau of Standards Technical Paper No. 48.
(3) A. C. Davis, "Fineness and Sieving of Portland Cement." *Cement & Cement Manufacture*, February, 1932.
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(5) H. Kühl, "Feinzement." *Zement* No. 8, February, 1931.
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Hints and Helps for Superintendents

Correcting Belts That Jump Flanged Pulleys

By C. H. Wright
Snyder, N. Y.

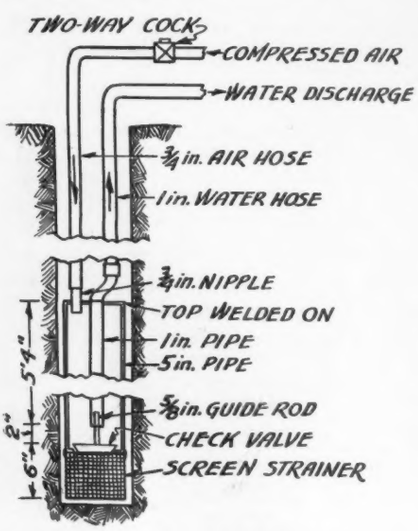
OCCASIONALLY plants report trouble with belts running on flanged pulleys. The belt starts to jump off the pulley and finally becomes unmanageable. In a case where I had a belt driving a compressor with a flanged pulley I found that by substituting a pulley 1 in. wider than the flange pulley and with considerable crown it became almost impossible to throw the belt, which had become uncontrollable on the flanged pulley.

Air Cylinder for Pumping Water from Blast Holes

By Nelson Severinghaus
Lithonia, Ga.

THE ACCOMPANYING illustration shows an air cylinder made up with ordinary pipe fittings and air hose which has proved very practical for removing water from blast holes just before loading at the Rock Chapel plant of the Consolidated Quarries Corp.

In operation the cylinder is lowered to the bottom of the hole by means of the attached hose. The two-way compressed air cock is then turned to release air from the cylinder until the cylinder has filled with water. The cock is then turned to admit compressed air which empties the cylinder out through the water hose. This is repeated until the hole is dumped dry.



Section through blast hole

By this means holes can be cleared in a fraction of the time formerly required when using a tripod and hand-winch-operated bailer.

Dimensions of this apparatus could be changed for use in any size of drill hole. Holes at Rock Chapel are 6 in. in dia. and about 90 ft. deep.

Economical Machine for Stripping

STRIPPING COSTS have been substantially lowered at the silica sand deposits of the Standard Silica Co., Ottawa, Ill., by the use of a Koehring

Reduces stripping costs

Dumptor. This machine with its dump body, which is illustrated in the accompanying illustration, can be used in the orthodox manner to haul overburden from the pits to the dumps.

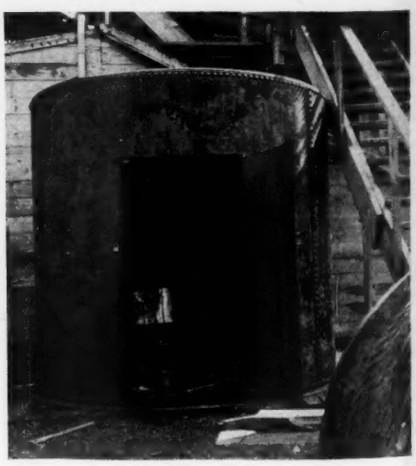
According to F. D. Chadwick, general superintendent, the machine has also proved successful as a push scraper for directly removing overburden from the flat-lying strata of clean sand. Where the distance is short enough and the overburden sufficiently loose, the Dumptor simply scrapes and pushes the dirt along with the end of the dump body working in a nearly upright or dumping position as shown. By its use as many as five men have been dispensed with in the stripping operation.

The unit illustrated weighs 11 tons and has a capacity of 6 cu. yd. of dirt. It is powered by two 10-20 International Harvester motors. Mr. Chadwick is at the controls demonstrating how the machine is operated.

Fireproof Oil Storage at Gravel Plant

THE Metropolis, Ill., plant of the Western Indiana Sand and Gravel Co. was one of the interesting plants of the section and assisted the industry as a whole by pioneering in the washing of sand and gravel with equipment that could be classed as out of the ordinary. The plant is at present being dismantled. While there are today many plants that wash gravel with rather elaborate methods, thus making what might be called a refractory gravel into a commercial product, this plant using a special arrangement of the Dorr washer was among the early plants to tackle gravel that required more than ordinary scrubbing to make it a salable article.

The accompanying illustration shows the method of constructing an oil storage house at this plant that is simple and fireproof. The storage house is simply an inverted steel tank into which a doorway has been cut with a torch. The piece of metal thus cut from the tank serves as a door.



Old steel tank makes fireproof house

Stockpile provides own grade for filling

Stockpiling Crushed Stone

A SIMPLE METHOD of stockpiling crushed stone that may be used to advantage at some plants is shown in the accompanying illustration.

The stone is drawn from the bins into end-dump trucks which are then backed up an incline formed by the pile of stone and dumped at the end of the pile. Heavy planks laid on the top of the pile serve as a runway for the trucks.

Pit Storage of Washed Gravel

IN the southern states it is common practice for the sand and gravel operator who has an excess of one or two sizes of gravel to take them by train to the pit from which they were dug and dump these aggregates back into the dredge pond.

The advantage of this system of storage is that no additional recovery equipment or space is needed, for the dredge can be moved close to this submarine storage and the gravel pumped back to the washer when desired.

Another great advantage of this scheme favorable to southern operations is that, owing to the universal presence of clay in the deposits, any gravel that has been through the plant once and was not thoroughly washed can be dumped back to the pit and thus receive a second treatment.

In the illustration only a portion of the stockpile is shown, but in the background is shown the pipe line and the stationary screening plant by which this stored material can be rescreened.

The dredge boat delivers to a stationary screen and the oversize discharges back to the gondolas.

This pit storage is convenient and economical for handling

Inclined screws of washer

Novel Drive for a Screw Washer

THE accompanying illustrations show a rather unusual method of driving washing or dewatering screws in a sand and gravel plant.

These inclined screws are usually driven through bevel gears, but in this instance a universal coupling or knuckle joint was used as indicated to transmit the power from a short horizontal countershaft to the inclined shaft of one of the screws.

This method of driving was used at the plant of the Gezon-Battjes Gravel Co., Grand Rapids, Mich., and was installed by the Link-Belt Co.

Washer drive, with universal joint

Use Rubber Hose for Transporting Sand and Gravel

ON DREDGING and other sand and gravel operations there occasionally arises need for a short section of flexible pipe for transporting materials. An English producer is reported to have had satisfactory results with a 6-ft. length of 8-in. rubber hose. According to the *Quarry Managers' Journal,* this section has been in service for over two years. It is estimated that more than 96,000 cu. yd. of sand and gravel have passed through it, and reports state that it shows no signs of breaking down as yet.

Rock Products Clinic

Data on Blasting

THE EDITOR: In your issue of July 16 there appears on page 30 a letter signed "Midwest Super" and entitled "Wanted—Data on Blasting."

My impression upon reading this request is that the author wants to know how blasting practice can be reduced to mathematical precision. In other words, he wants to know the disruptive effort needed to break rock and how many foot pounds of energy he must supply at a given point to produce the desired fragmentation in a quarry face. He asks specifically how the blasting authority with no previous experience would go about it to determine this factor.

In the first place, a blasting "authority" without previous experience can hardly be classed as an authority on the subject.

Second, in the great majority of cases where an expert has been called in to solve a blasting problem the success of his recommendations will depend greatly on the experience he has had.

Blasting cannot be reduced to an exact mathematical problem because no two blasts in rock, or no two blast holes, for that matter, were ever shot under identical conditions. The physical condition existing in naturally formed rocks change every foot or less, both laterally and vertically. These changes are caused by a variety of chemical and mineralogical conditions existing within the rock mass and by a multiplicity of points of weakness caused by bedding planes, jointing, fissures, and solution cavities. Most of these are not visible and the expert must depend upon those things he can see in the quarry face and correlate that data with the knowledge he has gained by past experience.

It is exceedingly doubtful if such mathematical precision, even if available for a homogeneous sample of each type of rock, could be used except for very general application because of the physical differences just mentioned, many of which have occurred after the rock was formed and which annihilate its uniformity as a mass.

On the other hand, fundamental studies along such lines might bring to light factors so far unsuspected in blasting practice. The U. S. Bureau of Mines has made some experiments in the explosive crushing of rocks and ores at its Minneapolis experiment station. The method used is to thoroughly saturate in water the sample to be crushed or exploded, place it in a closed chamber, raise the temperature to a predetermined point and then suddenly release the external pressure. The crushing or disrupting effect is accomplished by the sudden expansion to steam of the water inclosed in the pores of the material. This experimental work was undertaken for the purpose of finding a means of differential crushing of complex ores, but the possibilities of such a line of investigation are expanding daily. Possibly such experimentation with different types of rocks would develop a means of determining the approximate internal force necessary to break typical specimens of different rocks. If so, the operator could correlate with such information the physical characteristics of various explosives, such as rated strength, speed of detonation, etc., as a guide in selecting the amount and kind necessary for his particular problem. However, even were this possible, the physical differences in the quarry face would present problems which experience alone can solve. Without experience on which to base an hypothesis the operator must rely upon the old method of "cut and try." J. R. THOENEN.

Washington, D. C., July 19, 1932.

Inequitable Quarry Property Leases on Royalty

THE EDITOR: One of the most glaring examples of an uneconomic contract is the lease made in the past for quarry lands under which quarry operators are laboring and struggling to live up to during this period of falling prices.

The land owners having everything in their favor in the past have driven hard bargains by exacting high minimum rentals in boom periods at the expense of having an unhappy and often failing quarry operator in the ensuing less prosperous years. This custom of exacting too high guarantees has resulted in many quarry operators never reaching the minimum rental figure in their actual sales made and consequently paying every year a larger percentage than they can profitably afford.

Favorable conditions at the time the agreement was made all point to the land owner. First: The quarry operator at the time thought he would have a monopoly in the locality and was eager to get control of the land at any price. Second: The quarry operator, unlike the average merchant, could not exert any power of substitution, since the land was the only suitable land upon which a permanent crushing plant could be built in the locality. This condition might have been lessened if the quarry operator could have foreseen the rise of the roadside quarry operator who sets his plant up for a particular job and only binds himself to pay on the basis of the tonnage moved.

In other words, the roadside quarry operator, who sets his plant up for a particular job, knows what tonnage he expects to remove and only pays accordingly. He has hit upon a newer and more scientific method of leasing quarry lands; he is sure that the rental payments are only going to be a certain percentage of his costs. Roadside quarry operators are by no means the only ones using this type of lease, as merchants and realtors throughout the country realize that rent adjustment, which does not necessarily mean rent reduction, is the paramount need at this time. With the minimum charge materially reduced or done away with, quarry operators would have more confidence and a fairer opportunity.

Taxes in many communities have been reduced, with the result that less funds are available for road work, which in turn decreases the output for the quarry operator. The land owner, on the other hand, receives the high minimum rental from the quarry operator, regardless of conditions, but pays less taxes on the leased property.

Arbitrary standards upon which leases on quarry lands have been made in the past are obsolete. Yes, even the method of basing minimum rentals on the investment is unsuccessful from the standpoint of both owner and lessee. A dollar goes further today than for many years, due to prices on all commodities being down, yet the minimum rentals on quarry lands remain as high as ever.

To be mutually beneficial to both owner and quarry operator there must be a relation between rent, gross sales and net profit, otherwise the agreement is economically wrong. This relation can be maintained by eliminating the minimum rental entirely and by agreeing to pay a certain amount for every ton shipped or sold or by making the minimum rental a nominal sum sufficient to defray the carrying charges of the land.

"EASTERN QUARRY OPERATOR."

Beginning of Commercial Central-Mix Concrete

THE EDITOR: I was interested in the article on page 41 of your issue of July 16, 1932, wherein John A. Peabody lays claim to having originated in 1924 the idea of a central-mixing plant and the distribution of concrete therefrom by truck.

On March 17, 1921, the West Jersey Sand and Supply Corp., of Philadelphia, now merged with Warner Co., started the production and sale of central-mixed concrete, using open-top trucks.

Up to 1926 sand and gravel was measured by bulk, but from the first operation all cement was weighed. In 1926 weighing batchers were installed for sand and gravel. In 1927 a second plant was built, which supplied the South Broad street subway in Philadelphia.

Starting in 1921 with a yardage of about 30,000, this business had increased to over 75,000 yd. per year in 1927, which was the times of the merger with the Warner Co.

"A READER."

Editorial Comment

Put Your Shoulders to the Wheel!

By the end of 1932 the portland cement industry will have lost about $25,000,000 in two years' operation. Probably the other rock products industries have comparable records. The peculiar obstinacy of the typical human mind makes it impossible to learn or progress without taking a beating every once in so often. The industry has had its beating and has learned its lesson; it has reached the point of conceding that "breaking the other fellow" is costly and unprofitable; it has decided to make prices based on cost of production—not capacity production either—and to trust that the "other fellow" will have equal sense. It is sincerely to be hoped that all rock products producers will follow suit and concentrate their energies on making their own concerns profitable rather than in trying to break their competitors, or in trying to bluff them into thinking they can be broken.

Every legitimate assistance that it seems possible for a government to render is available for those who will help themselves, and still preserve our capitalistic system of private initiative and individual responsibility. The construction materials industry is especially favored because the government has especially tried to promote sound capital investment in new enterprises requiring construction. But things won't just happen because the government has made them possible. Each and every one of us who desires to maintain our present system and avoid state capitalism and government control of industry must put our shoulders to the wheel and *work*.

The country-wide agitation for reduction of government costs is real and must be reckoned with. The need for ready cash and the temptation to rob state highway department funds is very real and must be reckoned with. Government costs should be reduced. We all know every business has had to reduce costs and promote efficiency. We all know that our municipal, county, state and national governments have been and are run extravagantly and they should have reduced costs long ago. The present agitation on the part of business men and the general public is highly commendable and should have all the encouragement possible. Economy and efficiency in government are not incompatible with the construction of more and better public works. In fact they should of themselves lead directly to more and better public works. But it is up to you and I to demonstrate this fact to our rather hysterical friends in other lines of business and the public.

In the same way it does little good merely to rail at robbery of highway funds for the general purposes of government, knowing that the need of funds from any source is pressing. We must be constructive in our thoughts and comments as well. Business and real property are suffering acutely from high taxes. Money must be found to meet the public needs. That the public needs should be reduced to the lowest possible figure is trite. The fact remains the need is there now and pressing. There is no logical reason why gasoline, lubricating oil and a few other products of industry should be singled out to carry the entire burden of producing these needed funds. A general sales tax provides a fairer method.

No one who proposes a new tax is popular, but if we would preserve gasoline tax money for the purpose for which it was intended it is obvious we must provide a substitute method of raising the money needed for other things. The opposition to the national act was shortsighted. Most of those who opposed it now see that. However, state funds may still be raised by a general sales tax. Mississippi already has one. There is no better way to bring about a popular understanding and appreciation of government costs. According to experience such a general sales tax is not so unpopular as predictions would make it.

We are all in a position where we must give and take. We are all stockholders in our municipal corporations and we are all part of our county, state and national governments. A writer in *Engineering New-Record* has listed some of the things efficient local governments require: (1) Fewer governmental units; (2) enlistment of competent personnel; (3) effective budget administration; (4) proper fiscal calendar; (5) adequate financial planning; (6) coordination of departmental activities; (7) utilization of governmental research. These are all objectives that we can work for, individually and collectively. We can achieve lower government costs without sacrifice of needed public utilities and public works. We can work to provide emergency revenues by other means than robbing public works construction funds.

And the first step is to put our own houses in order by making prices for our products on a level that renders our industries profitable. We are pauperizing industry if we do not. Pauper industries are worse citizens than pauper individuals because they make pauper individuals. Pauper individuals have to be cared for by the government. Pauper industries will have to be cared for by the government. If we do not want our industries put on pauper rations by the government, we'll just have to ration ourselves with the amount of business available, and if we do that we can have the margin for the better things in life the same as we have in times past. American business initiative and energy have never failed us yet, once a goal was established, and we do not expect failure now. We have all been more befuddled than downhearted.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	*Dividend
Allentown P. C. 1st 6's[27]	7-25-32	93	98	
Alpha P. C. com.[6]	7-23-32	6	7	25c qu. Apr. 25
Alpha P. C. pfd.[2]	7-25-32	60	80	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[19]	7-23-32	88¾	.....	
American Aggregates com.[10]	7-23-32	1	3	
American Aggregates pfd.[19]	7-23-32	5	15	1.75 qu. Jan. 1
Amer. Aggr. 6's, w.w.[19]	7-23-32	32	38	
Amer. Aggr. 6's, ex.w.[19]	7-23-32	30	36	
Amer. L. & S. 1st 7's[27]	7-25-32	70	80	
American Silica Corp. 6½'s[39]	7-26-32	No market		
Arundel Corp. com.	7-25-32	16¼ actual sale		75c qu. July 1
Bessemer L. & C. Class A[4]	7-22-32	.....	2	
Bessemer L. & C. 1st 6½'s[4]	7-22-32	11	15	
Bloomington Limestone 6's[27]	7-25-32	.....	20	
Boston S. & G. new com.[37]	7-21-32	2	5	5c qu. July 1
Boston S. & G. new 7% pfd.[37]	7-21-32	20	30	87½c qu. July 1
California Art Tile, A	7-22-32	1½	4¼	
California Art Tile, B[9]	7-21-32	.....	5	
Calaveras Cement com.	7-22-32	.....	2	
Calaveras Cement 7% pfd.[9]	7-21-32	.....	70	1.75 qu. July 15
Canada Cement com.	7-23-32	5¾	5⅞	
Canada Cement pfd.	7-23-32	36	40½	1.62½ qu. June 30
Canada Cement 5½'s[42]	7-21-32	73	.....	
Canada Crushed Stone bonds[42]	7-21-32	62	.....	
Canada Crushed Stone com.[42]	7-21-32	2	.....	
Certainteed Products com.	7-23-32	1⅛	2	1.75 qu. Jan. 1
Certainteed Products pfd.	7-23-32	6⅛	8⅛	
Certainteed Products 5½'s	7-23-32	25 actual sale		10c qu. June 1
Cleveland Quarries	7-25-32	.....	40	
Consol. Cement 1st 6½'s, A[44]	7-26-32	4	7	
Consol. Cement notes, 1941[27]	7-25-32	No market		
Consol. Cement pfd.[27]	7-25-32	.....	45	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	7-22-32	70	75	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	7-21-32	.....	50	
Consol. Rock Prod. com.[35]	7-21-32	5c	15c	
Consol. Rock Prod. pfd.[35]	7-21-32	25c	50c	
Consol. Rock Prod. units[35]	7-21-32	½	1	
Consol. S. & G. pfd. (Can.)[42]	7-21-32	.....	50	1.00 qu. May 16
Construction Mat. com.	7-22-32	.....	2	
Construction Mat. pfd.	7-22-32	1	2½	
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[35]	7-21-32	25½	28	
Coosa P. C. 1st 6's[23]	7-21-32	14	20	
Coplay Cem. Mfg. 1st 6's[19]	7-23-32	30	40	
Coplay Cem. Mfg. pfd.[47]	7-25-32	5	10	
Dewey P. C. com.[47]	7-25-32	75	85	
Dolese and Shepard	7-25-32	14	16	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.[42]	7-21-32	.....	28	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.[42]	7-21-32	.....	5	
Edison P. C. com.[27]	7-25-32	No market		
Federal P. C. 6½'s[47]	7-25-32	40	45	
Giant P. C. com.[2]	7-25-32	½	2	
Giant P. C. pfd.[2]	7-25-32	3	6	
Gyp. Lime & Alabastine, Ltd.	7-23-32	3	3¼	
Gyp. Lime & Alabastine 5½'s[42]	7-21-32	40	.....	
Hermitage Cement com.[11]	7-23-32	2	6	
Hermitage Cement pfd.[11]	7-23-32	18	25	
Ideal Cement 5's, 1943[29]	7-23-32	70	75	
Ideal Cement com.[29]	7-23-32	6½	8½	50c qu. July 1
Indiana Limestone units[27]	7-25-32	No market		
Indiana Limestone 6's	7-15-32	5	10	
International Cem. com.	7-23-32	8¾	9	50c qu. Mar. 31
International Cem. bonds, 5's	7-23-32	56 actual sale		Semi-ann. int.
Kelley Island L. & T.	7-25-32	9	12	25c qu. July 1
Ky. Cons. Stone com.	7-25-32	.....	2	
Ky. Cons. Stone pfd.	7-25-32	.....	50	
Ky. Cons. St. 1st Mtg. 6½'s[45]	7-22-32	15	20	
Ky. Cons. St. V. T. C.[45]	7-22-32	1	2	
Ky. Rock Asphalt com.	7-25-32	.....	1	
Ky. Rock Asphalt pfd.	7-25-32	.....	25	
Ky. Rock Asphalt 6½'s	7-25-32	.....	70	
Lawrence P. C.	7-23-32	.....	9	
Lawrence P. C. 5½'s 1942[2]	7-25-32	25	33	
Lehigh P. C. com.	7-23-32	6	6¼	
Lehigh P. C. pfd.	7-23-32	48½ actual sale		1.75 qu. July 1
Louisville Cement[7]	7-21-32	60	80	
Lyman-Richey 1st 6's, 1935[13]	7-22-32	85	95	
Marblehead Lime 6's[14]	7-22-32	No market		
Marbelite Corp. com.[35] (cement products)	7-21-32	5c	50c	
Marbelite Corp. pfd.[32]	7-21-32	50c	.....	
Marquette Cement com.[47]	7-26-32	2	4	
Marquette Cement pfd.[47]	7-26-32	40	45	1.50 qu. July 1
Marquette Cem. Mfg. 1st 5's, 1936[16]	7-26-32	70	.....	
Marquette Cem. Mfg. 1st 6's, 1936[16]	7-26-32	75	.....	
Material Service Corp.	7-26-32	4	9⅛	
McCrady-Rodgers 7% pfd.[22]	7-21-32	30	32	87½c qu. June 30
McCrady-Rodgers com.[22]	7-21-32	5	10	75c qu. Jan. 26
Medusa P. C. pfd.[47]	7-25-32	50	55	1.50 qu. Apr. 1
Medusa P. C. com.	7-25-32	5	8	
Monarch Cement com.[47]	7-25-32	50	60	
Michigan L. & C. com.[6]	7-23-32	45	.....	
Missouri P. C.	7-25-32	5½	.....	25c qu. Jan. 30
Monolith Portland Midwest com.[35]	7-21-32	20c	40c	
Monolith Portland Midwest pfd.[9]	7-21-32	25c	35c	
Monolith P. C. com.[9]	7-21-32	½	1	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	7-21-32	1.12½	2	40c s.-a. Jan. 1
Monolith P. C. units[9]	7-21-32	2¾	5	
Monolith P. C. 1st Mtg. 6's[9]	7-21-32	33	36	
National Cem. (Can.) 1st 7's[27]	7-25-32	80	90	
National Gypsum A com.[27]	7-25-32	1	2	
National Gypsum pfd.[27]	7-25-32	18	22	1.75 qu. July 1
National Gypsum 6's[3]	7-26-32	55	.....	
Nazareth Cement com.[25]	6-10-32	3	.....	
Nazareth Cement pfd.[25]	6-10-32	45	.....	
Newaygo P. C. 1st 6½'s[27]	7-25-32	72	.....	
N. Y. Trap Rock 1st 6's	7-23-32	43 actual sale		
N. Y. Trap Rock 7% pfd.[30]	7-25-32	.....	35	1.75 qu. July 1
North Amer. Cem. 1st 6½'s[18]	7-22-32	13	16⅞	
North Amer. Cem. com.[48]	7-22-32	.....	1	
North Amer. Cem. 7% pfd.[48]	7-22-32	1	2	
North Shore Mat. 1st 5's[45]	7-26-32	25	30	
Northwestern States P. C.[47]	7-25-32	16	20	
Ohio River S. & G. com.	7-25-32	.....	8	
Ohio River S. & G. 7% pfd.	7-25-32	.....	98	
Oregon P. C. com.[9]	7-21-32	8	12	
Oregon P. C. pfd.[9]	7-21-32	80	85	
Pacific Coast Aggr. com.[40]	7-21-32	.....	½	
Pacific Coast Aggr. pfd.[40]	7-21-32	.....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	7-22-32	10	12	
Pacific Coast Aggr. 7's, 1939[5]	7-21-32	1½	3½	
Pacific Coast Cement 6's[5]	7-22-32	40	.....	
Pacific P. C. com.	7-22-32	3	5	
Pacific P. C. pfd.[5]	7-22-32	28	33	1.62½ qu. July 5
Pacific P. C. 6's[5]	7-22-32	50	.....	
Peerless Cement com.[21]	7- 9-32	25c	75c	
Peerless Cement pfd.[21]	7- 9-32	3	5	
Penn.-Dixie Cement com.	7-25-32	1⅛ actual sale		
Penn.-Dixie Cement pfd.	7-22-32	5	7⅜	
Penn.-Dixie Cement 6's	7-15-32	28	31	
Penn. Glass Sand Corp. pfd.[19]	7-23-32	50	60	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's[19]	7-23-32	69	73	
Petoskey P. C.	7-25-32	1	1½	
Port Stockton Cem. com.[9]	7-21-32	No market		
Riverside Cement com.[9]	7-21-32	.....	12	
Riverside Cement pfd.[9]	7-21-32	55	60	1.50 qu. Aug. 1
Riverside Cement, A	7- 8-32	.....	7	
Riverside Cement, B[9]	7-21-32	70c	1	
Sandusky Cement 6½'s, 1932-37[27]	7-25-32	70	80	
Santa Cruz P. C. com.[5]	7-22-32	40	.....	$1 qu. July 1
Schumacher Wallboard com.	7-22-32	1	.....	
Schumacher Wallboard pfd.	7-22-32	3	14	50c qu. May 15
Signal Mt. P. C. pfd.[47]	7-25-32	1	5	
Southwestern P. C. units[35]	7-21-32	150	200	
Southwestern P. C. pfd.[47]	7-26-32	65	70	$2 qu. July 1
Standard Paving & Mat. (Canada) com.[42]	7-21-32	2	3	
Standard Paving & Mat. pfd.[42]	7-21-32	.....	28	$1 qu. May 16
Superior P. C., A[9]	7-21-32	23	27	27½c mo. Aug. 1
Superior P. C., B[9]	7-21-32	4	5¼	12½c July 20
Trinity P. C. units[47]	7-25-32	18	23	
Trinity P. C. com.[47]	7-25-32	1	2	
Trinity P. C. pfd.[47]	7-25-32	17	20	
U. S. Gypsum com.	7-23-32	14⅛	14½	40c qu. June 30
U. S. Gypsum pfd.	7-25-32	90	95	1.75 qu. June 30
Wabash P. C.[47]	7-26-32	10	11	
Warner Co. com.[47]	7-26-32	2	3	
Warner Co. 1st 7% pfd.[47]	7-26-32	35	40	1.75 qu. Apr. 1
Warner Co. 6's, 1944, with war.[47]	7-26-32	48	52	
Whitehall Cem. Mfg. com.[30]	7-21-32	.....	80	
Whitehall Cem. Mfg. pfd.[30]	7-21-32	.....	55	
Wiscon. L. & C. 1st 6's, '33[15]	7-26-32	30	35	
Wolverine P. C. com.	7-25-32	½	1	
Yosemite P. C. A. com.[9]	7-21-32	90c	1.10	

*Latest 1932 dividend.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hemphill, Noyes and Co., New York City.

Peerless Portland Cement

THE annual report of the Peerless Portland Cement Corp., Detroit, Mich., for the year ended December 31, 1931, gives the following statement of earnings and balance sheet:

STATEMENT OF EARNINGS OF THE PEERLESS CEMENT CORP.
(For year 1931)

Net sales—804,250 bbl.			$ 985,096.75
Cost of cement sold			1,019,289.64
Gross operating loss			$ 34,192.89
Selling expense	$ 107,686.36		
Administrative expense	139,103.28	$ 246,789.64	
Miscellaneous expense	$ 2,850.99		
Miscellaneous financial expense	2,118.47	4,969.46	251,759.10
Net operating loss			$ 285,951.99
Bond interest		$ 106,571.61	
Bond expense		34,337.76	140,909.37
Provision for depreciation of fixed assets			441,868.41
Net loss to surplus			$ 868,729.77
Surplus Reconciliation			
Earned surplus December 31, 1930			$ 179,767.29
Capital surplus created through reduction in ascribed value of no par stock from $25 to $10 a share by action of stockholders at meeting held December 30, 1931			$3,582,810.00
			$3,762,577.29
Prior years' income tax adjustments		$ 402.43	
Dividends paid on preferred stock		7,332.50	
Reduction in book value of treasury stock to new ascribed value		6,965.34	
Reduction in book value of assets by action of board of directors		1,386,819.07	
Operating loss for 1931		868,729.77	2,270,249.11
Capital surplus December 31, 1931			$1,492,328.18

BALANCE SHEET OF THE PEERLESS CEMENT CORP.
(As of December 31, 1931)

ASSETS

Current assets:			
Cash on hand and in banks		$ 20,406.84	
Accounts and notes receivable	$ 193,402.23		
Less: Reserve for doubtful accounts and cash discount	76,086.83	117,315.40	
Inventories:			
Supplies and repair parts	$ 278,246.03		
Raw materials	79,423.25		
Cement finished and in process	282,920.44	640,589.72	$ 778,311.96
Prepaid expenses—insurance, taxes, rent, etc.			49,009.32
Investments			112,232.02
Fixed assets:			
Property, plant and equipment		$7,654,988.15	
Less: Reserve for depreciation		2,386,381.50	5,268,606.65
Total assets			$6,208,159.95

LIABILITIES

Current liabilities:			
Notes payable—Banks		$ 187,000.00	
Trade		11,913.25	
Mortgage		17,666.72	
Accounts payable—Trade		57,107.69	
Unclaimed dividends		458.80	
Accrued interest		3,318.82	
Accrued taxes		5,818.09	
Reserve for bond refunding expense		15,000.00	
Land contract payable, maturing in 1932		20,000.00	
First mortgage 5½% bonds maturing November 10, 1931	$ 40,000.00		
First mortgage 5½% bonds maturing November 10, 1932	38,000.00	78,000.00	
First mortgage 6½% bonds maturing January 2, 1932	$ 121,500.00		
Less: Sinking fund deposits	105,416.70	16,083.30	$ 412,366.67
Long term obligations:			
Land contract payable, excluding amount shown as current liability		$ 35,000.00	
Mortgages payable		9,924.10	44,924.10
Bonded indebtedness:			
First mortgage 5½% general and refunding bonds	$ 284,000.00		
Less amount shown as current liability	78,000.00		
	$ 206,000.00		
Less sinking fund	11,500.00	194,500.00	
First mortgage 6½% gold bonds	$1,405,500.00		
Less amount shown as current liability	121,500.00	1,284,000.00	1,478,500.00
Capital stock and surplus:			
7% preferred stock—Authorized, 12,000 shares; outstanding, 4090 shares		$ 409,000.00	
No par stock—Authorized, 320,000 shares; outstanding, 238,854 shares	$2,388,540.00		
Less: Treasury stock, 1749.9 shares	17,499.00	2,371,041.00	
Capital surplus		1,492,328.18	4,272,369.18
Total liabilities			$6,208,159.95

Maturing in August

THE following issues of rock products securities will mature August 1, 1932:

Issue	Amount
Petoskey Portland Cement 6% notes	$150,000
Signal Mountain Portland Cement 6% notes	476,500

Alpha Cement Statement

THE Alpha Portland Cement Co., Easton, Penn., reports for 12 months ended June 30, 1932, net loss of $1,193,449 after taxes, depreciation, etc. This compares with net income of $546,583 equivalent after 7% preferred dividend requirements to 57 c. a share on 711,000 no-par shares of common stock in 12 months ended June 30, 1931.

The balance sheet as of June 30, 1932, shows total assets of $27,841,789 comparing with $30,507,541 on June 30, 1931. Current assets, including $4,902,440 cash and marketable securities, amounted to $7,862,452 and current liabilities were $335,801. This compares with cash and marketable securities of $6,222,988, current assets of $9,612,736 and current liabilities of $640,692 on June 30, 1931. Surplus, including $5,648,500 arising from reduction of stated value of common stock in 1931, amounted to $6,286,429 on June 30 last.

Penn.-Dixie Cement Statement

THE Pennsylvania-Dixie Cement Corp., New York City, and subsidiaries, for the 12 months ended June 30, 1932, report profit of $350,902, before depreciation, depletion and interest, against $2,011,634 in the 12 months ended June 30, 1931. After provision for depreciation, depletion and interest there was a net loss of $1,643,140, against a net loss of $115,551 in the preceding 12 months.

Current assets June 30, 1932, amounted to $5,446,660, including $2,756,989 cash and short-term securities. Current liabilities were $409,555. This compares with cash and short-term securities of $3,043,124, current assets of $6,507,256 and current liabilities of $636,473 on June 30, 1931.

Medusa Cement Suspends Preferred Dividend

THE directors of the Medusa Portland Cement Co., Cleveland, Ohio, recently decided to suspend the payment of the quarterly dividend due July 1 on the preferred A stock. The last regular quarterly distribution on this issue was made on April 1, 1932.

Lehigh Cement Statement

THE Lehigh Portland Cement Co., Allentown, Penn., for the 12 months ended June 30, 1932, reports net loss of $484,020, after depreciation, taxes, etc., against net profit of $1,631,440, equal to 46 c. a share on 450,348 shares of common, after preferred dividends, in the previous 12 months.

Recent Dividends Announced

Riverside Cement pfd. (qu.)	$1.50, Aug. 1
Liberty Limestone 7% pfd. (qu.)	1.75, July 1

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending July 23:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25990. To cancel all commodity rates on **limestone, fluxing, broken,** carloads, minimum weight 50,000 lb., from Brandon, Cavendish, Center, Rutland, Leicester Jct., Middlebury and New Haven, Vt., to all points in New England and Trunk Line territories, and apply class rates. Reason—To cancel obsolete rates on limestone, fluxing, broken, from points on Rutland R. R. to West Rutland, Vt. (Clarendon & Pittsford R. R.) to all points in New England and Trunk Line territories.

26008. **Crushed stone** (trap rock), (See Note 3), from Westfield, Mass., to Chatham, N. Y. Present, $1 per net ton; proposed, 80c. Reason—To meet competition of nearby quarry, thereby securing traffic from rail carrier.

TRUNK LINE ASSOCIATION DOCKET

29495. **Crushed stone and crushed stone screenings,** carloads, in open top equipment (See Note 2).

	From Templeton, Penn.	
To	Proposed	Present
Mayport, Penn.	60*	70
Brookville, Penn.	70*	80
	From W. Winfield, Penn.	
To	Proposed	Present
Mayport, Penn.	80*	90
Brookville, Penn.	90*	100

Rates in cents per net ton. Emergency charge not included.

*To expire December 31, 1932, present rates to continue thereafter. (See Note 5.)

29514. **Crushed stone,** carloads (See Note 2), from Jamesville, N. Y., to Antwerp, N. Y.; $1.20 per net ton. Present rate, $1.40. Reason—Proposed rate is comparable with rate from Jamesville, N. Y., to New Berlin, N. Y.

29287. **Sand,** carloads (See Note 2), to Drummondville and Quebec, Que., from Perth Amboy district, Metuchen to Maurer, N. J., inclusive, 26½c, and from Raritan River R. R. stations, McDonoughs to Milltown, N. J., inclusive, 33½c per 100 lb.

29289. **Sand,** carloads (See Note 2), from Perth Amboy district, Metuchen to Maurer, N. J., inclusive, to Drummondville, Que., 26½c per 100 lb.

29475. **Crushed stone** (not coated), carloads (See Note 2), from Buffalo, N. Y., stations to Bingham, Penn., $1.10 per net ton.

29522. To establish switching rate of $8.10 per car on **crushed stone,** from C. H. Ziegenfuss and Co. plant to 12th Street Yard and Union Street Yard, Lehigh Valley R. R. team track deliveries at Allentown, Penn., L. V. R. R. This rate is to expire December 31, 1932. (See Note 4.)

29332. **Building sand,** carloads, only when loaded in open top equipment without tarpaulin or other protective covering (See Note 2), from Hancock, Berkeley Springs and Great Cacapon, W. Va., to Winchester, Va., $1 per net ton.

29440. **Stone, crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), to Elkhart Jct., Lafferty Siding, Boetcherville, Mt. Savage, Weigert's Siding, Kriegbaum and Ellerslie, Md., from Leonard Siding, $1.70, and from Security, Md., $1.40 per net ton.

29545. **Stone, crushed, coated or not coated with oil, tar or asphaltum,** carloads (See Note 2), from Oriskany Falls, N. Y., to West Albany, Albany and Karner, N. Y., $1.40 per net ton. Present rate, $1.50. Reason—Proposed rate is comparable with rate to Schenectady, N. Y.

29546. **Stone, crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), from Martinsburg, W. Va., to Deal, Penn., $1.60 per net ton. Present rate, $1.80. (See Note 5.)

29548. **Sand, blast, engine, fire, foundry, glass, molding, quartz, silex or silica** (See Note 2), from Tatesville, Penn., to Osceola Mills, Penn., $1.62 per net ton. Present rate, $1.89. Reason—Proposed rate compares favorably with rates from Mapleton district to Punxsutawney, Penn.

29562. **Crushed stone,** carloads (See Note 2), from Pounding Mill, Va., to C. & O. Ry. stations: Marrowbone, Ky., $1.20; Pikeville, Ky., and Elwood, Ky., $1.30, and End of Line No. 2, Ky., $1.40 per net ton. Reason—Proposed rates are comparable with rates from Highland, Ky., to same points of destination.

29563. To amend N. Y. C. R. R. Tariff I. C. C., N. Y. C. No.15402, W. S. R. R. Tariff I. C. C., W. S. No. 5983, publishing rates on **stone, natural** (other than bituminous asphalt rock), **crushed; and stone, crushed, coated with oil, tar or asphaltum,** carloads, and N. Y. C. R. R. Tariff I. C. C. N. Y. C. No. 15844, and W. S. R. R. Tariff 6345, publishing rates on **sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand); **sand,** in open top equipment, and **gravel,** carloads, from various points on the N. Y. C. R. R. and W. S. R. R. to stations named below, to provide for change in minimum weights shown below: Proposed (See Note 3) but not in excess of weights shown below: 60,000 lb. to Knoxville, Phillips, Cowanesque, Westfield, Potter Brook, Elmer, Tanner, Harrison Valley, Mills, Ulysses, Penn., and Alexander and Attica, N. Y.; 70,000 lb. to Inghams, Dolgeville and Salisbury Centre, N. Y.; 80,000 lb. to Cascade Mills, May's Mills, Seneca Mills, Milo Mills, Moore's, Keuka Mills and Penn Yan, N. Y. The present minimum weight to all points except Inghams, Dolgeville and Salisbury Centre is 90% of marked capacity of car, except when car is loaded to cubical or visible capacity actual weight will apply. To Inghams, Dolgeville and Salisbury Centre the minimum weight is 80,000 lb. Reason: Operating restrictions limiting load based on maximum track-bearing limitations prevent handling of loads up to minimum weights now effective, and changes proposed are necessary in order not to penalize shippers.

29286. **Sand,** carloads (See Note 2), from Raritan River R. R. stations, McDonoughs to Milltown, N. J., and Perth Amboy district to Ottawa, Ont., 26½c per 100 lb.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

CENTRAL FREIGHT ASSOCIATION DOCKET

32193. To establish on **sand and gravel,** carloads, in open top equipment, from Columbus, O., to Mt. Vernon, O., rate of 70c per net ton, emergency charge not included. Present rate, 80c.

32199. To establish on **stone, crushed, coated with oil, tar or asphaltum,** carloads, from Jackson, O., to Bainbridge, Greenfield, Ironton, 93c; Washington C. H., 113c; Waverly, 83c; Portsmouth and Chillicothe, O., 108c per net ton, plus emergency charge. Present, class rates.

32212. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk), **agricultural limestone** (not ground or pulverized) (in bulk in open top cars only), and **agricultural limestone screenings,** carloads, from Sandusky, O., to Andover, 110c, and Latimer, O., 125c per net ton. Present, 120c to Andover and 135c per net ton to Latimer, O.

32213. To establish on **sand, lake or beach,** and **gravel,** when loaded in open top cars, carloads, from Erie, Penn., to Jefferson, O., rate of 80c per net ton. Present—Via N. Y. C. R. R., 90c per net ton (intermediate to Andover, O.), via N. Y. C. & St. L. R. R., rate of 80c.

32216. To establish on **stone, crushed, limestone, unburned, agricultural,** in bulk, in open top cars, carloads, to South Bend, Ind., from Woodville and Gibsonburg, O., rate of 145c per net ton. Present, classification basis.

32217. To establish on **stone, dolomite,** and **stone, fluxing,** in straight or mixed carloads, from Gibsonburg, Woodville and Maple Grove, O., to Mt. Vernon, O., rate of 113c per gross ton. Present, classification basis.

32218. To establish on **agricultural limestone,** carloads, minimum weight 60,000 lb., from Genoa and Martin, O., to points in Indiana, rates as shown in Exhibit A attached.

EXHIBIT A

(To representative points in Indiana)

To N.Y.C. R.R. stas.	Proposed Minimum weight 60,000 lb.	Present Minimum weight 50,000 lb.	Route via which proposed rate will apply
Kendallville	165	180	*
Vistula	192	200	*
Osceola	197	200	*
South Bend	197	200	*
New Carlisle	197	200	*
La Porte	197	220	*
Olivers	197	200	*
Ginger Hill	197	200	*
North Liberty	197	200	*
Walkerton	197	200	*
Hamlet	197	220	*
C.C.C. & St.L. Ry.			
Granger	192	200	**
Goshen	192	200	**
Milford	192	200	**
P. R.R.			
La Otto	165	(7)	†
Avilla	165	190	†
Wolcottville	165	190	‡
La Grange	165	190	‡
Columbia City	192	200	§
Plymouth	197	230	§
Hanna	197	230	§
P. M. Ry.			
Wellsboro	197	230	¶
Magee	197	230	¶
Belfast	197	230	¶
Ackerman	197	230	¶

(7)—Sixth class
*N.Y.C. R.R. direct.
**N.Y.C. R.R., Elkhart, Ind., C.C.C. & St.L. Ry.
†N.Y.C., Kendallville, Ind., P. R.R.
‡N.Y.C., Kendallville, Ind., P. R.R.
§N.Y.C., Ft. Wayne, Ind., P. R. R.
¶N.Y.C., La Porte, Ind., and P.M.

32221. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk), and **limestone, unburned, agricultural** (in bulk, in open top cars), carloads, from Genoa, Martin, Marblehead, Bellevue and Sandusky, O., to points in Pennsylvania, rates as shown in Exhibit A attached.

EXHIBIT A

(Rates to representative points in Pennsylvania)

To	From Genoa and Martin, O. N.Y.C. R.R. Prop.	Pres.	From Marblehead, O. Penn. R.R. Prop.	Pres.
Oil City	160	(*)	150	(*)
Warren	190	(*)	190	265

To	From Genoa and Martin, O. Penn. R.R. Prop.	Pres.	From Marblehead, O. Penn. R.R. Prop.	Pres.
Spartanburg	190	(*)	190	(*)
Tryonville	190	(*)	190	(*)
Titusville	190	(*)	190	(*)
Rouseville	190	(*)	190	(*)

To	From Bellevue, O. N.Y.C. R.R. Prop.	Pres.	From Sandusky, O. N.Y.C. R.R. Prop.	Pres.
Oil City	150	(*)	140	220
Warren	190	(*)	190	240
Titusville	190	(*)	190	240

To	From Bellevue, O. Penn. R.R. Prop.	Pres.	From Sandusky, O. Penn. R.R. Prop.	Pres.
Spartanburg	190	(*)	190	(*)
Centerville	190	(*)	190	(*)
Tryonville	190	(*)	190	(*)
Titusville	190	(*)	190	240
Rouseville	190	(*)	190	240

Rates in cents per net ton.
*Sixth class rate.

32234. To establish on **crushed stone,** in open top cars, carloads, from Marion, O., to Cleveland, O., rate of 80c per net ton, emergency increase in addition. Present, 90c, emergency increase in addition.

32235. To establish on **crushed stone,** in open top cars, carloads, from McVitty's, O., to Blissfield, O., rate of $1.15 per net ton, emergency increase in addition. Present, 17c, emergency increase in addition.

32237. To establish on **crushed stone**, carloads, from Putnamville, Ind., to Morgantown, Ind., rate of 110c per net ton, plus emergency charge, via C. I. & L. Ry., Bloomington, Ind.-I. C. R. R. Present, classification basis.

32238. To amend N. Y. C. Tariff I. C. C. L. S. 1649, L. & M. I. C. C. 183 and L. & M. Ohio 320, naming rates on **ground or pulverized limestone**, and N. Y. C. Tariff I. C. C. 1364, naming rates on lime from producing points on the N.Y.C. R. R. and L. & M. R. R., to the extent of including therein the following rule: "Mixed carloads of building lime and/or agricultural, chemical and land lime and/or unburnt, ground or pulverized limestone will be charged at actual weight and at the applicable rate for each of the respective commodities, subject to minimum weight of 50,000 lb., for each mixed carload, deficit in the minimum weight, if any, to be paid for at the rate applicable on the highest rated article in the mixture." Present—Rate on highest rated article and highest minimum weight of articles in car to govern as provided in Rule 10 of Official Classification.

32246. To establish on **crushed stone, crushed stone screenings and agricultural limestone** (not ground or pulverized), in bulk, in open top cars, carloads, from Narlo, O., to Conneaut, O., and Erie, Penn., rate of 94c per net ton, subject to emergency tariff. Present, 110c to Conneaut, O., and 140c to Erie, Penn., plus emergency charge.

32299. To establish on **slag, coated with oil, tar or asphaltum** (the oil, tar or asphaltum not to exceed 10% by weight of the commodity as shipped), carloads, from Youngstown, O., to Ripley, W. Va., rate of 13c, subject to emergency charge. Present, 23c (sixth class), subject to emergency charge.

32306. To establish on **sand, blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica**, carloads, from Althom, Penn., to Erie, 101c; Brockway, 139c; Butler, 189c; Jeannette, 195c; South Greensburg, 195c; Elmira, 216c; Mt. Pleasant, Penn., 229c per net ton. (Emergency charge not included.) Present, classification basis.

32307. To establish on **silica**, carloads, minimum weight 40,000 lb., from Cincinnati, O., to New York, N. Y., 580c per net ton. Present, 37c (sixth class).

32308. To establish on **sand and gravel**, carloads, in open top equipment, from Massillon, O., to Mansfield, O., rate of 80c per net ton, emergency charge not included. Present, 90c per net ton (emergency charge not included).

32309. To establish on **crushed stone**, carloads, minimum weight when shipped in bulk, in open top cars, from Greenfield, O., to Blue Ash, O., rate of 95c per net ton, via D. T. & I. R. R., Washington C. H., O., P. R. R. Present, 100c per net ton, per D. T. & I. Tariff 1186-F.

32344. To establish on **sand and gravel**, carloads, in open top equipment, carloads, from Columbus and South Columbus, O., to Lancaster, O., rate of 55c per net ton, subject to emergency charge. Present, 60c per net ton, subject to emergency charge.

32351. To establish on: Group A—**Slag**, in open top equipment, carloads, minimum weight 80% of marked capacity of car, and Group B—**Sand** only (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads, from Cleveland, O., to Kingsville and Ashtabula, O., 70c, plus emergency charge of 6c, and from Fairview, Penn., to Kingsville and Ashtabula, 55c, plus emergency charge of 6c. Present: 90c from Cleveland to Kingsville; 80c to Ashtabula, O.; 59c from Fairview, Penn., to Kingsville and Ashtabula, O., plus emergency charge of 6c.

32353. To establish on **silica sand**, carloads, from Ottawa, Ill., district to Lima, O., the same rates as now applicable in connection with the Erie R.R., viz., $2.10 per net ton when crude and $2.25 when washed or processed, via the B. & O. R. R. Present, classification basis.

32354. To establish on **sand**, all kinds, carloads, from Edenburg, Penn., to Youngstown, O., rate of 60c per net ton, via P. & L. E. R. R. Present, 76c per net ton.

WESTERN TRUNK LINE DOCKET

2292-K. **Stone, broken, crushed or ground**, or **broken and crushed slag**, carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Randville, Mich., to Joliet, Ill. Present rate, $2.70 per net ton, plus emergency charge; proposed, $2.10 per net ton, plus emergency charge.

8049. **Slag, ground, or slag, ground, and limestone, ground, mixed** (See Note 2), from Buffington, Ind., to Minneapolis and St. Paul, Minn., and Kansas City, Mo. Rates: Present—Ground slag, class rates apply; ground limestone, St. Paul and Minneapolis, 12c cwt.; Kansas City, Mo., 16c cwt. Proposed—St. Paul and Minneapolis, Minn., 225c per net ton; Kansas City, Mo., 270c.

I. C. C. Decisions

3446. Plaster Board. Plaster board between points in southern territory; No. 23155, Certain-teed Products Corp. vs. A. & R. et al.; and I. and S. No. 3419, plaster board between points in official territory and from that territory to points in Canada. The Interstate Commerce Commission held an error in finding in original report, 179 I.C.C. 283, as to the rate on plaster board, carloads, Acme, Tex., to Auburndale, Fla., since January 15, 1928, corrected. Commission now finds that rates east of Memphis, Tenn., were not subject to Note A in the tariff and that a combination amounting to $11.63 a ton was applicable. Protestants claimed a rate of $10.63 under the combination rule, but the commission found that that would not be the proper way to construct the rate.

Proposed I. C. C. Decisions

24626. Cement. Lone Star Cement Co., Alabama, vs. A. T. & S. F. et al. By Examiner Smith. Rates, cement, Spocari, Ala., to points in Missouri, Oklahoma and Texas, unreasonable to destination in scales III and IV territories in Missouri, Oklahoma and Texas to extent they exceeded scale III and IV rates prescribed in Oklahoma Portland Cement Co. vs. D. & R. G. W., 128 I. C. C. 63, computed on distances over the actual routes of movement. The examiner proposed that if in the period of movement there were combinations lower than the rates determined under the scales, such combinations might be substituted for the rates resulting from the application of the scales. Reparation proposed.

Better River Facilities Necessary

ADDITIONAL LOCKS and dams are necessary to move the large quantities of limestone along the Allegheny river, J. Frank Tilley, secretary of the Allegheny River Improvement Association, reports. New structures must also replace the existing antiquated locks and dams in the lower river at Pittsburgh, he states. A discussion of these requirements was to take place at the thirty-sixth annual convention of the association, the *Pittsburgh Post-Gazette* reports.

Rules Rates Are Preferential

THE Ohio Gravel Co., located at Cincinnati, Ohio, July 12 won its case before the Public Utilities Commission against the A. C. & Y. railroad, on charges of preferential rates given competitors of the Cincinnati company. The commission ruled rates given the Ohio Gravel Co. were both too high and preferential to competitors, and ordered a reduction on road building material, effective August 1.

Requests Low Gravel Rate

REQUEST has been made of the Nebraska State Railway Commission by the Burlington railroad for authority to make a rate of 80 c. per ton on sand and gravel from Fremont to Goodwin, effective during the remainder of this year. There are three pits at Fremont.—*Lincoln* (Neb.) *Star.*

Road Material Men Form State Association

INITIAL STEPS were taken at a meeting held July 20 at Madison, Wis., to form an association of the individuals, firms and corporations handling road building construction materials in that state.

Twenty-five owners of sand and gravel pits attended the meeting, which was presided over by Dr. C. R. Nutt, Waupaca. The statement was made that the intent of the association was to bring about better conditions in the road material and cement trades.

Both cement men and makers of black top paving materials will be welcome to membership. Several firms and individuals not represented at the meeting wrote saying they would be glad to join the association.

Gordon Daggett, formerly of Madison and for several years material engineer of the state highway commission, and more recently executive secretary of the Wisconsin Aggregate Association, was given charge of the organization work.

Another meeting was to be held July 29 to complete the formal organization.—*Madison* (Wis.) *Journal.*

Cement Reference Laboratory Plans Third Inspection Tour

ANNOUNCEMENT is made that the cement reference laboratory will at an early date start a third inspection tour among cement testing laboratories. At present these field inspections are made without charge. It is expected that through most localities an inspector will pass only once during the next two years.

Requests for inspection will be acknowledged. A short time before the actual inspection a laboratory will be advised of the approximate date of the inspector's arrival. Inspection visits will not be made to laboratories which, in previous inspections, have been found to be deficient in apparatus and methods until such time as those laboratories give some assurance that deficiencies have been remedied, the announcement states.

Massachusetts Will Not Divert Highway Funds

DEFEAT of a proposed diversion of $2,000,000 from the highway fund of Massachusetts was encountered when the senate of the state legislature rejected the bill providing for this diversion. It was intended to use this money for distribution to the cities and towns of the state for use in welfare work. The defeat of this bill makes complete the rejection of the legislature of all proposed measures for diverting highway funds for relief purposes. Earlier in the session a suggested ½-c. increase in the gas tax, proceeds to go to the municipalities, was defeated.

Foreign Abstracts and Patent Review

Effect of As_2O_3 on Portland Cement. T. A. Shann states that he has been examining specimens of mortar and concrete for liberation of lime by running distilled water from a tank through the porous specimen placed in a rubber tube equipped with a siphon to prevent access of carbonic acid from the air, and analyzing the discharged water. He has used this method in determining the rate of lime liberation in portland cement to which arsenic trioxide was admixed in different percentages. He found that the liberation of lime is decreased by addition of As_2O_3 to portland cement. The cement containing 20 grams As_2O_3 per 100 grams cement gave the best results. There was again an increase in lime liberation in a mixture of 30 grams As_2O_3 to 100 grams portland cement. At the start perceptible quantities of As_2O_3 enter with the lime in solution and the As_2O_3 solubility increases with the As_2O_3 content of the mixed cement. In the mixtures heated to 190 deg. C. the As_2O_3 liberation is somewhat lower than in the unheated mixtures. The liberation of lime as well as As_2O_3 decreases rapidly.—*Zement* (1931) **20**, 37, pp. 816-817.

Formula for Cement for Marine Use. W. Marschner states that recently a patent was applied for on a process for obtaining a sea-water resisting concrete by adding phosphorites or other insoluble or difficulty-soluble salts of phosphoric acid, for example, to the cement during clinker grinding in a proportion to obtain (for example) 70 parts cement, 30 parts phosphorite and 300 parts sand. Test specimens of this mixture showed high soundness in a 20% ammonium sulphate solution. The protective effect against sea-water is explained to exist in the conversion of the free lime in the cement into calcium phosphate, thus removing from attack by the sea-water the portion of lime endangered by salt solutions.—*Zement* (1931) **20**, 39, p. 875.

Reactions in Portland and Alumina Cement Mixtures. H. E. Schwiete and H. Elsner v. Gronow state that by the addition of alumina cement the strength of portland cements is not varied proportionately to the added quantity of fused cement; and the times of set of alumina-portland cement mixtures deviate from those of the two components. These two facts of experience point to the presence of reactions in the setting of portland-alumina cement mixtures, which do not occur in the setting of each cement by itself. These reactions are explained by means of equations and test results.

The essential constituents of portland cement are the compounds $3CaO \cdot SiO_2$ and $3CaO \cdot Al_2O_3$, and of alumina cement the compounds $CaO \cdot Al_2O_3$ and $2CaO \cdot SiO_2$.

The hydration of tricalcium silicate occurs according to the following equation:

$$2(3CaO \cdot SiO_2 + \text{water} \rightarrow 3CaO \cdot 2SiO_2 \cdot nH_2O + 3Ca(OH)_2;\ n = 1 \ldots 3)$$

and that of tricalcium aluminate according to the equation:

$$3CaO \cdot Al_2O_3 + \text{water} \rightarrow 3CaO \cdot Al_2O_3 \cdot nH_2O.$$

(at temperatures $t > 25$ deg. C. (77 deg. F.), $n = 6$).

The monocalcium aluminate hydrates under splitting off of aluminum hydroxide to $2CaO \cdot Al_2O_3 \cdot nH_2O$, according to the equation:

$$2(CaO \cdot Al_2O_3 + nH_2O \rightarrow 2CaO \cdot Al_2O_3 \cdot nH_2O + 2 \cdot Al(OH)_3,$$

whereas the dicalcium silicate under splitting off of $Ca(OH)_2$ hydrates to $3CaO \cdot 2SiO_2 \cdot nH_2O$. In setting of a mixture of portland cement and alumina cement the following reactions occur:

I. $2(3CaO \cdot SiO_2) + \text{water} \rightarrow 3CaO \cdot 2SiO_2 \cdot nH_2O + 3Ca(OH)_2$;

II. $3CaO \cdot Al_2O_3 + \text{water} \rightarrow 3CaO \cdot Al_2O_3 \cdot nH_2O$;

III. $2(CaO \cdot Al_2O_3) + \text{water} \rightarrow 2CaO \cdot Al_2O_3 \cdot nH_2O + 2Al(OH)_3$;

IV. $2(2CaO \cdot SiO_2) + \text{water} \rightarrow 3CaO \cdot 2SiO_2 \cdot nH_2O + Ca(OH)_2$.

These reactions and their manner of procedure are discussed in detail.—*Tonindustrie-Zeitung* (1932) **56**, 16, pp. 222-224.

New Jugoslavian Cement Specifications. The cement specifications for Jugoslavia were officially announced on December 31, 1931. The hydraulic modulus

$$\frac{CaO}{SiO_2 + Al_2O_3 + Fe_2O_3}$$

should be at least 1.7. The content of sulphurtrioxide (SO_3) should not exceed 3%, and the content of magnesia (MgO) should not exceed 5%. Rapid set cements should start to set before 15 minutes, medium set cements between 15 and 60 minutes, and slow set cements after 60 minutes. Fineness should be not more than 3% on the 900-mesh (76-mesh) sieve with 0.1 mm. wire diameter, and not more than 25% of the weight of cement on the 4900-mesh (178-mesh) sieve with a wire diameter of 0.05 mm. The strengths of standard mortars (1 part cement, 3 parts sand by weight) are for ordinary portland cement:

Storage	Strengths in kg. per sq. cm. Tensile	Compressive
After 7 days water storage	16	200
After 28 days combined storage	28	320
After 28 days water storage (required only for marine construction)	....	280
And for high grade portland cement:		
After 1 day air and 1 day water storage	20	240
After 7 days water storage	28	400

—*Tonindustrie-Zeitung* (1932) **56**, 12, pp. 174-175.

Effect of Additives on Blast-Furnace Cement. M. Paschke and W. Meyer, in order to determine the influence of additive material on the sintering temperature of the raw flour, on the condition of the fine clinker texture, and on the technical qualities of a clinker burned in a crucible furnace and of the cement produced from it, studied the action of roasted pyrites, of fluorspar, calcium chloride, potassium chloride, and sodium chloride used as additives in the amount of 0.3, 0.6, 0.9, 1.5 and 3.0% by weight to raw flour prepared of limestone and basic granulated blast furnace slag.

Up to an addition of 0.6% the additive materials in every respect effected favorable influence upon the diverse qualities of the raw flour and upon the clinker and cements prepared from it. The calcium choride aggregate acted the most favorable of all, but in case of a high modulus of lime the lime content of calcium chloride must be considered. The potassium chloride additive effected the second best result, if it did not exceed 0.3%; the same can be said of sodium chloride additive. In the use of flourspar, too much additive can under certain conditions cause a heavy drop in strengths. The roasted pyrites gave the poorest results.—*Zement* (1931) **20**, 38, pp. 850-854.

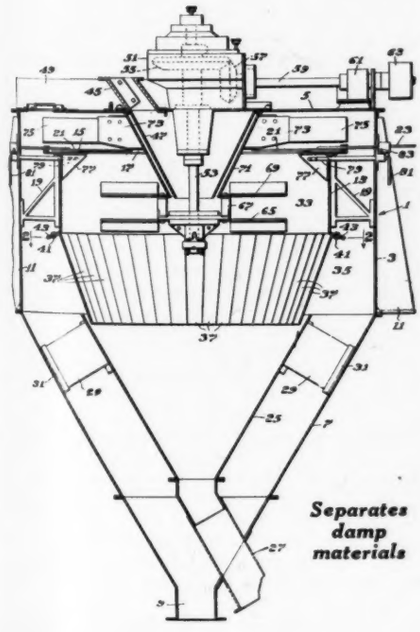
Water Absorption of Setting Cement. P. Haensel, R. Steinherz and C. L. Wagner present a preliminary report on tests conducted at intervals from 1928 to 1931, inclusive, at the German University in Prague, Czechoslovakia, to better understand the problem of set of cement. Their attention was given first to water absorption of the cement, in which they separated solutions from the cement paste by means of a centrifuge and examined the solutions as well as the paste; this forced sedimentation method occurs far more rapidly than natural sedimentation. The belt-driven adjustable speed centrifuge was provided with four cups, and sedimentation could be effected at different speeds besides at different lengths of time and at different states of set of the cement. The test operations and results of analysis are reported in detail. Almost immediate separation into consistent cement paste and solution is possible by the centrifugal sedimentation process.—*Zement* (1931) **20**, 50, pp. 1048-1052; 51, pp. 1064-1069.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

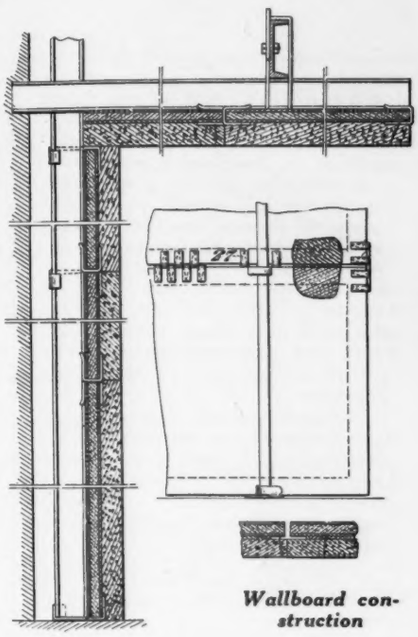
Plaster of Paris Composition. The inventor says that he had previously applied for a patent covering a mixture of plaster of Paris and cotton linters. But he found in practice that with more than a small percentage of cotton linters it was hard to get a homogeneous mixture, especially with unskilled labor. In this patent he therefore covers the use of a mixture containing less than 1% of cotton linters by weight. He finds that a very good mixture is made with 15 lb. of cotton linters with 1 ton of plaster and has covered this in a separate claim. The advantage claimed for cotton linters over other materials used for the same purpose is that they are light in weight, stainless and do not absorb water. The large percentage of plaster of Paris insures that the wall will have practically the strength of a solid plaster wall. The mass is claimed to be strong and capable of holding nails. *George H. A. Ruby, U. S. Patent No.* 1,799,325.

Air Separator. The separator shown has two novel features which are covered by the patent. The first is the set of vanes (37). These are long and are set to form an almost continuous wall. The heavier particles will strike against them many times as they are carried around in the swirling air current. Fine adhering particles will be dislodged and be drawn between the vanes. This feature is said to make the separator more efficient on damp materials, although dry materials usually have fine particles adhering to the coarser. The other feature is the use of the baffles (77). These can be turned to various positions by the rod shown passing through the side of the separator and in this way the character of the separation may be varied. *Thomas J. Sturtevant, assignor to Sturtevant Mill Co., Boston, Mass, U. S. Patent No.* 1,826,406.



Separates damp materials

Plaster Board Building Construction. The inventor says that he has developed the described method of construction to avoid the lost time and expense of lathing and plastering a building. The frame of the building is of channel irons and the plaster board is fastened to the channels by metal clips. Four designs of these clips are illustrated as being adapted to attachment to wall and ceiling channels and the floor. Each plaster board has a block or tile of precast plaster cemented to it except for a space around the margin in which the clips lie. But these blocks or tile fit closely so as to make a smooth wall in the interior of the room. *Frederick M. Venzie, U. S. Patent No.* 1,823,998.

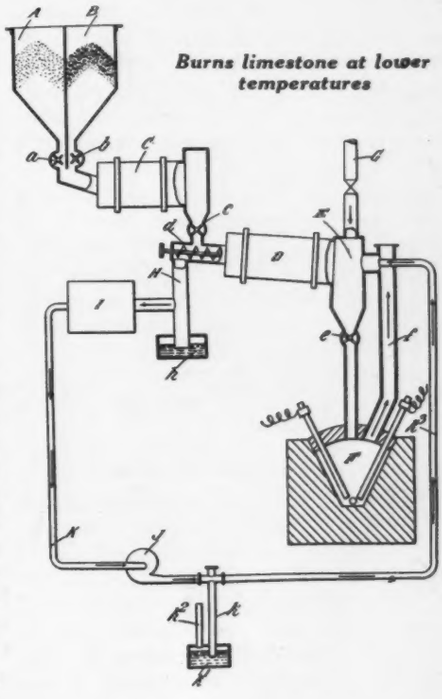


Wallboard construction

Method of Reducing Gypsum. The present methods of making sulphuric acid and cement from gypsum are objectionable, the inventor of this process says, because of the formation of calcium sulphide. He claims that this is due to the mechanical state of the mass burned, the reducing agent, as carbon, being merely mixed with the gypsum so that the oxygen of the air can get to it at once. In the presence of calcium sulphide the gypsum melts readily, interfering with the reduction by forming cakes. In shaft furnaces the gypsum or anhydrite is briquetted with clay, and in this method sulphurous acid is produced as a byproduct. But with the rotary kiln it is better to feed the material in a finely ground condition of a muddy consistency. The inventor of the process described grinds the gypsum and reducing agent fine and makes the mixture into balls by moistening. Some clay is added. In every case an excess of reducing agent is added to compensate for what may be burned off. This excess of reducing agent prevents the formation of calcium sulphide. The balls, or granules, are well adapted to be burned in a rotary kiln. *Alexander Hasselbach (Germany), assignor to Polysius Aktiengesellschaft, Dessau, Germany, U. S. Patent No.* 1,801,741.

Reduction of Calcium Carbonate for the Manufacture of Carbides. Limestone and coal or other carbonaceous fuel are fed from separate hoppers through rotary valves into a short rotary kiln which the inventors call a distillation chamber. Here the coal is distilled, leaving coke with the limestone. There must be enough coke to reduce the calcium oxide in the electric furnace that follows.

The kiln discharges into a hopper from which the coke and burned lime are fed to an electric furnace through a rotary valve. The very hot gases from this furnace go by a pipe to the distillation chamber. These gases are largely carbon monoxide and a part of this may be burned if the heat of the gas is not enough to burn the limestone and distill the coal. The gases are drawn backward through the kiln by a fan and circulated. A controlled portion is taken off through a waste pipe (*G*). The inventors say that a definite equilibrium exists between the temperature at which limestone is decomposed and the composition of the gases present, and that by controlling the percentage of carbon dioxide present they can burn the limestone at lower temperatures than are usually necessary. The method of circulating the hot gases which is shown permits the carbon dioxide content of the gases to be controlled. *Georges Patart, France, and Harold Nielsen, England, U. S. Patent No.* 1,811,021.



Burns limestone at lower temperatures

General Sales Tax Points Way to Save Highway Funds

Success in Mississippi Means Gasoline Tax Can No Longer Be Seized as "Only Way Out"

PRACTICALLY ALL MOVEMENTS to divert state highway gasoline tax and motor-vehicle license money have been defended as the only way that officials could devise to obtain relief funds or cash which they positively had to have for one reason or another.

Now, with the announcement that Mississippi's new general sales tax has proven satisfactory and returns more revenue than expected, the most plausible excuse of the diversionists of highway money has been knocked out from under them. Why finance general purposes of government from a sales tax on gasoline only? A tried and proven general sales tax is available, falling equitably upon all.

Gasoline Tax a Road Toll

The gasoline tax was not devised either as a sales tax or a use tax, but primarily as *road toll*. Instead of stopping at the toll gate, the road user pays his toll at the filling station. The toll has been and is paid for road improvement and maintenance and to use it otherwise rankly and flagrantly violates the rights of the road user.

Injustice to Motorists Means Unemployment to Large Group

Moreover, injustice to the millions of motorist-payers becomes distress to many of the 3,000,000 workers in road-building and road-material industries. Employment is curtailed in about the only group of industries available to aid immediately unemployment to an appreciable extent—because roads and kindred types of public works are not only dollar-saving and furnish a high proportion of employment to common labor, but because the products are non-competitive. Road building is one of the few enterprises this country can safely go into on a large scale because it creates immediate buying power to almost the full extent of the cost, without producing a cent's worth of commodity which has to be sold on an already over-supplied market.

Sales Tax Basically Sound

As an emergency tax measure the general sales tax is basically sound. The Mississippi law is not hard to understand and apparently is not difficult to enforce. Mississippi is not a rich state, nor a particularly favorable area in any respect, for a tryout of legislation of this kind. But the tax is proving a very effective means of raising money and not only its sponsors, but a large proportion of the payers and a powerful section of the press already regard it with favor.

> ***ANY REDUCTION** of the funds available to the state highway department below that necessary for the constant improvement and extension of the state highway system will result in a loss of income from road use and a rapid depreciation of the tremendous investment already made. This is the economic brake that must be kept in efficient working order to stop raids upon these special road funds that can only result in the loss of a large part of the funds themselves.*
>
> *The state highway systems must be recognized as a vast public utility whose earning capacity, if kept up to a high degree of efficiency, is very large and constantly growing but whose earning power can be cut down overnight.*
>
> *—THOMAS H. McDONALD in "Engineering News-Record"*

The Mississippi law levies a tax of 2% on gross retail sales. It applies to substantially everything. It is now estimated to be producing about $250,000 per month, exceeding the fondest hopes of its proponents. This tax not only relieves possible demands for diversions of highway gasoline tax funds, but according to observers it will probably be the early means of placing Mississippi's financial house completely in order.

One commentator on the Mississippi sales tax law recently said: "There has been unreasoning opposition to a sales tax as such, whenever suggested in any of the Southern States. This, I understand, also has been true elsewhere. Such opposition was quite apparently based upon an unreasonable theory rather than upon actual fact. Mississippi has proven this to be a fact. Opposition in that state was very bitter. In spite of this the law was passed and since that time opposition has ceased. In fact, those that opposed it now feel that it is very successful."

Gasoline Tax Funds Spent on Roads Provide Employment

An indication of the possibilities of gasoline tax funds as a means of providing jobs, and of mitigating demands for direct charity, can be found in connection with the activities of Wayne County (Mich.) Highway Commission, as reported recently in the *Detroit Free Press*. The *Press* says, in its issue of July 9:

Forty-six hundred fathers having six or more children, who were originally getting $12 a week from the Welfare Department, have been paid nearly $2,000,000 since October by the Wayne County Road Commission for work on viaducts, bridges, roads, parkways and a two-mile seawall.

The results, as cited by Commissioner Chairman Edward N. Hines, recently:

Concreting of Gibralter road and building of two bridges on the same road two miles south of Trenton and east of River road. The highway was opened last week. A 20-ft. strip of concrete was laid on the 120-ft. right-of-way, dedicated without cost to the county, for a distance of a mile and one-third.

Completion of a new bridge over Ecorse Creek on West Jefferson avenue in Wyandotte. The commission is awaiting settlement of the approaches before opening the span.

Erection of a two-mile sea wall off the Lake Shore road, Grosse Pointe Farms, in preparation for the two-way road to be completed this fall. The new highway will consist of two 27-ft. concrete pavements with a park strip in the center. Some use is being made of the old road, but the new parkway practically will be built out in the lake. Workmen are now jetting and pounding to get settlement for the fill.

Grade Separations

Grade separaton completed between Base Line and Telegraph Super-Highways. This involved, among other things, construction of three river bridges and the highway viaduct and also the moving and straightening of the River Rouge channel.

Grade separation of the Pere Marquette south of Plymouth.

Grading of several miles of Ford road and Haggerty highway, grading of several miles and the building of several miles of good pavement on the Wayne County Parkway between Plymouth and Northville, grading and other work on Michigan super-highway between Wayne and Inkster, and a miscellaneous lot of other work such as the widening of shoulders, cleaning of ditches and other labor of the same character.

The record of accomplishments, Mr. Hines said, is the Road Commission's reply to critics on the County Board of Supervisors and other assailants of the highway plan who argued in October against a half-mill tax for county road purposes.

Opponents argued that it was no time to levy such a tax. The Road Commission and its proponents said that the tax would raise $2,300,000, that it would pinch no one, and that it was the economical thing to do "because the men who will receive money in wages will be recruited from common labor and welfare lists and will produce something of permanent character."

"If it had not been levied," said Mr. Hines,

"the community would not have saved anything. It would have had to pay these men through the welfare."

The men recruited were drawing $12 a week in relief doles because they had a maximum number of dependents in most cases. The men were split so that each got a full 55-hour week every other week. At winter peak the county had 2300 men at work each week. That means an actual payroll of double that number, since one group of 2300 men would be followed the next week by a second group of 2300.

Lazy Men Dropped

Up to a short time ago these men had received $1,842,000 in wages for the work done. With available money now running low, there are only 1400 men employed at present.

Requirements, with a few exceptions, are that a man be a citizen, that he have lived in Wayne county two or more years, that he have six or more dependents and that he be willing to work.

A close check disclosed a few stallers. They did not seem to want to work and they were dropped. The Road Commission, according to Mr. Hines, went farther and saw to it that such malingerers were not restored to the welfare lists.

"The taxpayers," said Mr. Hines, "now has something to show for what he spent, and that wouldn't have been the case if the money had been paid out for straight, unproductive relief.

"The burden has been so small that probably few persons have noticed it—about 50 c. on $1000. Men have been given work and the community benefited. Those roads and bridges will be with us when the depression has been long forgotten."

Pennsylvania Legislature Playing with Diversion

Pennsylvania is one of the important states where highway gasoline tax and motor-vehicle license revenues are still being used exclusively for highway construction and maintenance. The convening of the legislature of that state in special session on June 27, to consider unemployment and related problems, was followed immediately by the introduction of a flood of bills, several of which proposed to remedy the situation by creating more unemployment forthwith in the road building and material industries.

House Bill No. 52, by Representative Sewers, got an early start. This bill would appropriate $30,000,000 from the highway fund to the state Welfare Department. Later a proposal was made to reduce the amount carried by this bill to $6,000,000. Senate Bill No. 25, by Senator Fay, which also put in an early appearance, would appropriate the entire net revenue of the liquid fuels tax to counties for their road and bridge construction, for use of counties in paying off their indebtedness and for direct unemployment relief.

Another proposal which would seriously interfere with highway funds in the Keystone state is Senate Bill No. 4, by Senator Woodward, abolishing all special funds, including motor funds, putting the aggregate of these into the general fund of the state for appropriation and distribution by the legislature.

The Pennsylvania State Construction Council and other organizations have been active in pointing out the fallacies of these or any other measures which would reduce employment in the road building industries, and the Pennsylvania Chapter of the Associated General Contractors, the automobile clubs, and the newly organized Auto Users Association made known their opposition to measures threatening highway funds. The following statement by Colonel F. A. Warner, vice-president of the Mack-International Truck Corp., which appears in the current number of *Pennsylvania Manufacturers' Journal*, quotes a statement from the state construction council as follows:

The use of gasoline tax moneys for direct unemployment relief would be a flagrant case of robbing Peter to pay Paul. The $30,000,000 of such taxes which Pennsylvania's motorists pay into the State Highway Department's fund are now providing employment for many thousands of men. To take all, or any part, of that sum for direct unemployment relief would simply mean that men now engaged in highway work would become jobless. . . . With all of our basic industries suffering severely from the effects of the economic depression, this certainly is no time to make proposals that would result in a further curtailment of industrial production, which would mean further restriction in the circulation of money. No public revenue is getting a quicker or brisker circulation than that which comes from gasoline taxation. It would be rank folly to slow up the circulation of such important revenue.

Late indications are that Governor Pinchot does not favor the diversion of highway funds and that before adjourning the legislature will provide adequate unemployment relief legislation largely through reduction in expenditures for governmental administration.

Oklahoma Situation

In reply to a questionnaire sent out recently by the *Oklahoma News*, 140 candidates for the legislature favored some one or more plans for diverting highway funds and 62 were opposed to diversion. This poll indicates the rising tide of sentiment for diversion. When the legislature assembles in January it is certain that strong efforts will be made to divert a large portion of the present gasoline tax income for use in paying off the state's general deficit, which, we are informed, amounts to about $10,000,000.

As an interesting counter-move the Oklahoma Petroleum Marketing Association is launching a campaign to reduce the state gasoline tax from 5 c. per gal. to 2 c. per gal. on the grounds that this will reduce evasion of the tax by gasoline bootleggers who see profits in evading a 5 c. tax, but would not be able to operate their "racket" on a 2-c. margin. Obviously, this argument has nothing at all to do with the purpose of the tax; and as 2 c. per gal. would not take care of maintenance and meet bond interest to which the gasoline tax is obligated, additional revenue required for new construction and maintenance would have to come out of property taxes. So there seems little likelihood that the legislature will take kindly to the suggestion.

The Oklahoma Good Roads Association is meeting the situation with an appeal to the people of the state to support the present financial set-up for the state highway system, hundreds of miles of which are still unpaved, by retaining the present gasoline tax and spending all of it on roads. A number of the leading newspapers of the state are favorable and the movement is sponsored by leading citizens.

Nebraska Activities

Nebraska is facing a three-cornered fight with the large grain growers in the western part of the state advocating exemption of agricultural gasoline from the state tax, the Nebraska Petroleum Marketers campaigning for a reduction of the present 4-c. state tax to 2 c. per gal., and the Nebraska Good Roads Association struggling to maintain the financing system which is rapidly giving the state paved traffic lanes on which its future prosperity largely depends.

The following is a tentative road program adopted by the directors of the Nebraska Good Roads Association, July 6, 1932:

Believing the present economic adjustment makes it difficult to plan highway bonds on a sound basis, the directors of the Nebraska Good Roads Association deem it advisable not to submit such a proposition to the voters.

The present system of financing highway construction and maintenance in Nebraska is the most effective and progressive manner of hastening the return of prosperity by providing employment. To keep this program intact we favor:

(1) Retention of the 4-c. gasoline tax as it now stands.

(2) After a thorough study of results in our neighboring states we strenuously oppose all gasoline tax exemptions.

(3) We will resist all attempts to divert funds received from the gasoline tax and license fees for purposes other than the construction and maintenance of highways.

(4) We question the advisability of adopting a program of surfacing for our highways of a type which has not been given sufficient usage to prove its adaptability and economy over a long period of years.

(5) Considering the safety of life and property of the utmost importance, we favor adoption of a uniform traffic regulation and method of control in keeping with our present-day needs.

(6) We favor the removal of our highway program from all political invasion and believe this can be accomplished only by the establishment of a bipartisan, non-salaried commission.

(7) A study of license fees effective in other states has convinced this organization that those in force in Nebraska are sound and just. We favor the retention of all license fees on their present basis.

(8) In order to assist in the prevention of bootlegging of gasoline we recommend that the inspection of gasoline and the collection of fees and the adjustment of both be placed under some one state department.

Move Toward Cooperation

During the last few weeks have come many evidences that highway users and builders, material manufacturers, refiners

and distributors of motor fuel and motor vehicle manufacturers throughout the country are becoming aware of the need for cooperative action against misuse of highway funds.

In explaining a suggestion for cooperative action offered by W. R. Boyd, Jr., executive vice-president of the American Petroleum Institute, the *Oil and Gas Journal* says:

With respect to these problems the industry generally is exercised, and here and there, spasmodically and at great expense, trying to meet the issues as they arise. Without criticism of any of this valuable work, it is obvious that there is no national policy, that our efforts are uncoordinated nationally or even locally, and, due to this factor, frequently oil men or oil agencies work at cross purposes, thus making impossible effective work, and that the hastily constructed emergency machinery plus inevitable duplication results in an enormously increased aggregate time-consuming and money cost to the industry.

Some councilman proposes a municipal gasoline tax or a high license fee bill, and the representatives of companies, without opportunity for preparation or at great cost, rush in and expend time, energy and money presenting the best emergency defense that can be devised. Sometimes it is done without conference; result, nobody is satisfied, usually everybody is hurt.

A proposal is made to increase the gasoline tax in some state and the principal companies hurriedly and excitedly put together some machinery, employ someone, and the cost is inevitably several times what it would be if the machinery were all set and ready to function on a moment's notice. I am told that the committee in New York, in a few weeks, expended $27,500; in Massachusetts, in a few days, $5000, and in New Jersey, $48,000. Multiplying any one of these figures, or the average by 48, and it will readily be seen how rapidly the emergency defense fund will grow only to oppose gasoline tax increases.

It has been estimated that the industry has contributed here and there in 1932 to special funds to combat gasoline tax evasion over $500,000, also that almost $200,000 per annum is being contributed to finance the state code committees.

It would probably be safe to estimate that under present methods the industry will spend in the aggregate $1,500,000 during 1933 in an effort to oppose the various forms of taxation and regulation, to say nothing of the loss of time and actual expense to executives, attorneys and company employes with the consequent loss of application to the regular business which all these gentlemen have to conduct.

It does seem that in the interest of uniformity, efficiency and economy in cash expenditures we should now attempt to set up a nation-wide program that will coordinate nationally and locally all our refining and marketing defensive interests.

Most of the state legislatures will be in session the coming winter. If we are to prevent increases and diversion of gasoline taxes or intelligently initiate any movements to reduce any of these taxes, the program and machinery should be thoroughly organized and vigorously at work before winter comes.

While Mr. Boyd's plan is devised solely to serve the petroleum industry's viewpoint, the foregoing comment applies directly to the situation of the many industries dependent upon road building, and to that of the payers of road taxes as well.

An ideal organization for the purpose should aim at the principal objective of protecting the present equitable basis of highway taxation by resisting diversion of gasoline tax money to other than highway purposes, as well as unwarranted increases in tax rate for unrelated uses. A principal objective also should be to fight evasion of the gasoline tax by dishonest oil companies, farmers and others, as one of the most menacing phases of the entire situation.

Collection of gasoline taxes should be limited to the states.

There should be no exemption; all gasoline purchased should be taxed, in order to end present tremendous losses through fraudulent evasion.

The tax rate should be based upon the highway requirements of each state, including paving of principal routes through cities and towns.

Regardless of certain divergent interests of each group, the motorist and other road user organizations, highway officials, contractors, road material manufacturers, motor fuel refiners and distributors, and automobile and truck manufacturers can and should unite in the defense of these principles, the destruction of which would be grossly unjust and in many cases place unbearable burdens upon road users, at the same time working havoc on these industries with several million dependent workers.

Recent Newspaper Comment on Gasoline Tax Diversion

The theory of gasoline taxation is that thereby the motorist pays for the road as he rides. A further theory is that the car expense, including tires and fuel saved to the motorist by reason of improved highways, repays him for his gas tax expenditures.

But, if gas tax funds are diverted from highways and used for other purposes, the motorist is not getting what he is supposed to get, because the funds diverted are not spent on highway construction or maintenance.

They should be used for the intended purpose and no other. The gasoline tax should all be used to build and care for highways in this time when construction costs are lowest, and when this form of public enterprise offers exceptional opportunity for giving work to the unemployed.—*El Paso* (Tex.) *Times.*

* * * * *

Diversion of taxes, while small at present, is a menace in that these taxes are the backbone of stabilized highway building. Highway safety depends largely on continued road building. The 26,000,000 motor-vehicle owners are waking up to the fact that money they have sponsored for safe roads and continued construction is being used for other purposes.—*Georgia Highways.*

* * * * *

Utah motorists, in general, share the conviction of the Utah State Automobile Association, which is to the effect that the transfer of gasoline tax money to the state general fund is an ominous sign. The general fund has borrowed $700,000 from the gasoline tax fund, promising to repay it upon demand. There is no indication of where the money for repayment is to come from, and the automobile association may not be far wrong in inferring that no demand is to be made.

In the light of this situation is it surprising that the automobile association fears that loans from the tax fund are nothing more nor less than diversions? A similar experience in Salt Lake City affairs is well within the range of recent experience. The city cemetery reserve fund, amounting to in excess of $100,000 and designed to provide perpetual care for certain lots, was converted to the general fund and dissipated. This, of course, was in the nature of a loan, but to this day it has not been repaid and probably never will be, while taxpayers who derive no direct benefits pay the penalties.—*Sale Lake City* (Utah) *Tribune.*

* * * * *

There is little complaint about the gasoline tax, so long as it is used for the purpose of building roads. In a real emergency there are those who believe that it could be properly used for general purposes. But with a 2% sales tax, and almost a dozen other sources of tax money, there are few who will put the stamp of approval upon any measure that seeks to use road money for other purposes.

Gentlemen of the legislature, if you use good judgment you will now stay off the gasoline fund for budget balancing purposes. —*Jackson* (Miss.) *Clarion Ledger.*

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To cause a cessation of road building by diverting the gas tax would deprive the public of the most attractive bargains their moneys have ever purchased. Due to prevailing construction prices, bond issues, in some instances, today can be sold for 60 and 70 c. on the dollar and still buy more and better highways than bonds which sold at par a few years back.

If politicians honestly want to effect economies, let them look at the highway construction picture from an unbiased and impersonal angle; let them weigh present benefits derived from actual application of the gas tax against assumed advantages expected by diversion. The sincere politician will conclude that he should leave alone a branch of the government and its source of revenue with which the people are so thoroughly satisfied.—*Lone Star Construction.*

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Over the nation as a whole the highway systems are inferior to Indiana's. Some 2,500,000 of the 3,200,000 miles of highways in the United States are not even graveled. Not one hard surface highway extends across the continent. Still, gasoline tax money is being diverted in some states. The motor vehicle owners in those states ought to realize that they are being exploited. "Use of gasoline tax money for purposes other than road building," the Mississippi valley conference of state highway departments resolved recently, "is a breach of faith with the motor vehicle owner and a violation of the fundamental principle of justice in taxation."—*South Bend* (Ind.) *Tribune.*

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National opposition to the diversion of highway revenues from their purposes continues to grow. Far-sighted officials, supported by public opinion, are beginning to insist that funds intended for the construction and maintenance of good roads shall not be turned into other channels.—*The Economist.*

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Further attempts to inccrease the tax burden of automobile traffic should be re-

sisted, as should every attempt to divert the funds from present taxation to other channels than that of building up and maintaining an outstanding road system. If the roads do not need all the money now collected, part of the extreme burden now borne by automobiles and gasoline should be eliminated.—*Sacramento* (Calif.) *Union.*

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The Senate finance committee is piddling with the foolish and utterly vicious plan of diverting a portion of the gasoline tax fund to the general fund for the purpose of taking care of outstanding bond issues.

Public sentiment in Mississippi will not tolerate the use of gasoline tax money for any purpose other than road building.

Road building is the only reason for the levying of a tax on this commodity, and no financial plight of the treasury can be of sufficient gravity to justify a diversion from that purpose.—*Jackson* (Miss.) *Daily News.*

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We are not impressed with the idea of diverting the road money to other purposes than building roads. If the allocation of funds is stopped, so far as the road program is concerned, we see it slipping. The gasoline tax is a special sales tax for building roads, and if it is to be further diverted for other purposes it will not be long until our roads will be ruts and mudholes. And then, again, we doubt if motorists will be willing to submit to any such high gas tax if the money is to go into the general fund. They are willing to pay to build roads, but they may object when they are picked out to be held up for general purposes.—*Dalton* (Ga.) *Citizen.*

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Roads are inadequate for present traffic demands. Properly built roads lessen travel costs and extend motoring. More money is needed for roads for economy's sake, not less. Gas tax income must be protected and, for the best interests of the country, motoring should be stimulated, not thwarted.—*Sheffield* (Ala.) *Tri-Cities Daily.*

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Governor Pinchot and Secretary Lewis are to be commended for the stand they have taken in warning the motorists of Pennsylvania to be on their guard against any attempts that would seize their taxes and fees and place them beyond the jurisdiction of the highway department. Money spent for highways provides practical employment of real value to the public.—*Doylestown* (Penn.) *Intelligencer.*

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Gasoline tax collection in the hands of smaller units of government simply goes haywire. In Alabama, a half dozen counties and more than a hundred municipalities collect a gasoline tax in addition to the state tax. In one city, a 1-c. gasoline tax is building a municipal bathing beach; in another, it was proposed to levy a similar tax for the erection of an electric sign on a high hill.—C. R. Thomas, in *Georgia Highways.*

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It is evident that, as one petitioner after another applies for gas tax money, the fund is gradually being depleted to the point where it will be inadequate to take care of the needs for which it is paid, and this means one of two things: either the tax must be increased or its unpopularity will end in the change of the statutes under which it is collected.

It is the experience of other states where diversion of the funds were allowed, that it gradually becomes an item of contention and decreased in usefulness.

A dozen or more attempts have already been made to deflect the fund from its purpose—the maintenance and repair of highways—but most of them have failed. Only a year ago, the Municipal League of Illinois tried to break into the spending of this fund by seeking a division which would have given the cities of the state one-third of the receipts. This campaign was defeated with difficulty.—*East St. Louis* (Ill.) *Daily Journal.*

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It has been suggested in the columns of the daily press that the next major proposal as a Texas taxpayers' relief move will be to declare a year's holiday in road building. That suggestion is not predicated on tax reduction for road purposes. In other words, this idea is not prompted with the view of reducing or eliminating the gas tax now imposed on those using the highways and roads. It is a move to take the money now derived from the user of the highways in the form of gas tax derived funds; taking the money that the driver and owner of the passenger automobile, the truck and bus pay for having and getting good roads to travel over, and using it for paying the salaries of judges, the Railroad Commission, and supporting other branches of the government. Or maybe to be used to pay the salaries of the men employed by the state to collect the cigarette tax, or to pay militiamen in the oil fields where the traffic over the highways may be heavy and the highways badly in need of improvement.

Economies to be derived from good roads could be ignored. Industry could be paralyzed. Thousands of men can be thrown out of employment. Business can be made to suffer. Federal Aid funds, of which Texas receives more than any other state, and proportionately furnishes less to supply that Federal Aid from taxation, can be thrown away. We could ignore the fact that the state has more mileage of highways than any other state in the Union, and with the status of the highway development as it is (not half completed) permit the Federal Aid to lapse. When prices are low and when highways can be built at a minimum cost might be a good time to be thinking about a road holiday—especially by those who do not seem to be really thinking. When prices go up again and cost of road building increases, when we do not have the acute unemployment situation, and need of work for men to produce consumer purchasing power, and again are in for prosperous times, and such acute unemployment situation does not exist, we can pay the higher cost for roads. These needed roads must be built and will be built. That is a certainty.—*Texas Highways.*

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It is interesting to stand around a filling station and hear the comments on the government gasoline tax (all of which is diverted from highway purposes). One fellow bought 13 gal. of gas and paid 52 c. in taxes, 13 of it to Uncle Sam. "That's what I will have to contribute weekly to Uncle Sam's boards and commissions," he said.

A fellow with a little car bought 8 gal. While his taxes were only 32 c., he was redheaded because 8 c. of it was attributable to the $1,100,000,000 tax bill just passed by Congress. What he said was this: "I ain't going to vote for anybody that's in Washington now or ever has been there."

"And that's the way 75% of the customers talk," declared the station attendant.—*Omaha* (Neb.) *Journal-Stockman.*

Kentucky Gravel Consolidation Building New Plants

A CONSOLIDATION of three older sand and gravel companies has formed the new Sangravl Co., Inc., which has recently been chartered in the state of Kentucky. The companies which surrendered their charters when the new concern was organized are the Paducah Sand Co. of Paducah, Ky.; the Tennessee River Sand Co., also of Paducah; and the James Sand and Gravel Co. of Johnsonville, Tenn.

The Sangravl Co., Inc., will operate six plants along the Ohio river and in Tennessee. Three of these will be new plants, while the other three will be plants formerly owned by the companies in the consolidation. The new plants are at Louisville, Henderson and Kutawa, Ky., and the three old plants are at Johnsonville, Tenn., and two at Paducah.

The new company will operate six river dredges in connection with its plants, one of these being new, having recently been put into service. This is the dredge for the Louisville plant which began digging on July 18. At present this dredge is delivering its material to a New Albany, Ind., yard until the Louisville plant, across the river, is complete. It is expected that this plant will be in operation early in August, as work is progressing rapidly on the property. Since screening and washing are done on board the dredge this plant will serve as a storage and loading yard. Storage conveyors are already in place and a railroad spur has been run to the property.

The new dredge at Louisville is equipped with a 12-in. Morris pump and is steam driven. A tow boat, the *Sally H,* with a 120 hp. Diesel engine, will take care of the barges at Louisville and a derrick boat with a 2-yd. Owen bucket will do the unloading. The derrick boat is operated by a steam engine with a 10x12-in. cylinder.

T. L. Herbert, Jr., of Nashville, Tenn., is the president of the new company. F. W. Olcott is vice-president and P. B. Herbert is secretary and treasurer. Steve Click is in charge of sales for all of the plants and will operate the Louisville plant. Mr. Olcott will be in charge of the operations at the other five plants.

Tests Tar and Crushed Rock Roads in Northern Missouri

THE Missouri state highway department is to build a seven-mile experimental road in northern Missouri this summer to test a type of construction which has been used with satisfaction in the southern part of the state. The test section is a retread mixture of crushed rock and tar placed 1½ in. thick on roads with a good base. If it is found that this construction withstands the weather conditions in the northern part of the state it may be adopted as the type of construction used on the farm-to-market roads, the *St. Louis Globe-Democrat reports.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

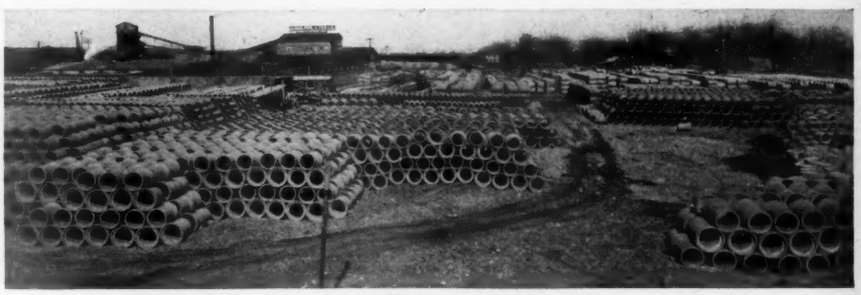
Peak Pipe and Tile Production Achieved by Modern Methods

Basic Materials in Michigan Factor in Development of Two Plants of Lamar Pipe and Tile Co.

By Hugh King Harris

WITH ready accessibility of raw materials and with ample markets close at hand, opportunity for concrete pipe plants at Grand Rapids and Saginaw, Mich., was offered. It remained for the Lamar Pipe and Tile Co. to take advantage of the opportunity. And in the short span of nine years this company has built a business which has a total daily capacity of 350 tons of pipe.

The Grand Rapids plant covers an 11-acre tract, ideally located along the super-highway stretching from the projected International Bridge at Port Huron to Chicago and the west, about 2 mi. from the west boundary of the city. This tract was selected due to the proximity of both the highway and the railroad which has spur tracks through the plant property. A gravel pit of the Grand Rapids Gravel Co. adjoins the Lamar properties, from which washed sand and gravel are obtained.



General view of yards at Grand Rapids, with plant beyond

The Lamar Pipe and Tile Co. was originally promoted by N. H. Battjes, with long and intimate experience in the gravel and contracting business; he was the first president, also general manager. In 1924 Mr. Battjes retired from the active management of the growing project, and was succeeded by C. E. Edwards as general manager, Mr. Battjes remaining as president of the organization. C. T. Jenks was appointed sales manager in April, 1924, and is still active in the position with the firm. C. H. Winchester is superintendent of the Grand Rapids plant; H. A. White of the Saginaw plant.

The main office ties in with the product and attracts favorable publicity

Offices Are Unique Feature

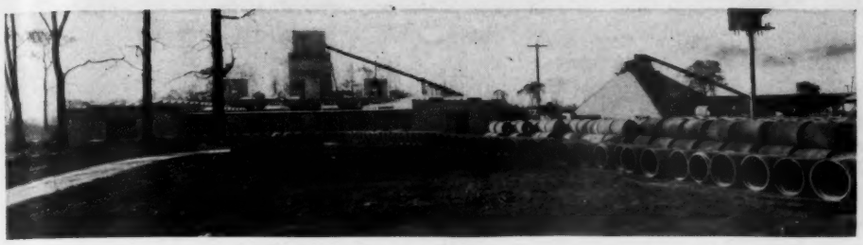
The main executive offices are located at the plant in Grand Rapids. Both its main and branch office buildings are unique. As publicity stunts they attract a great deal of favorable comment. As one motors along the road attention becomes focused for more than a mile up or down the highway on what seems the largest tile "out of captivity."

That "tile" proves to be the office of this huge plant. Both the offices have done much to center interest in the plants.

To the rear of the office at the Grand Rapids plant, stands the modern testing laboratory. This physical laboratory is equipped with all of the latest physical testing apparatus, and tests are conducted on a rigid basis. A.S.T.M. standards are maintained.

Production of the plant is subjected to tests on a 50,000 lb. capacity machine and, due to the rigid inspections in force, first quality production is high.

In each plant the inspectors are directly responsible to the general manager for quality of production. In both plants constant tests and experiments are conducted. This



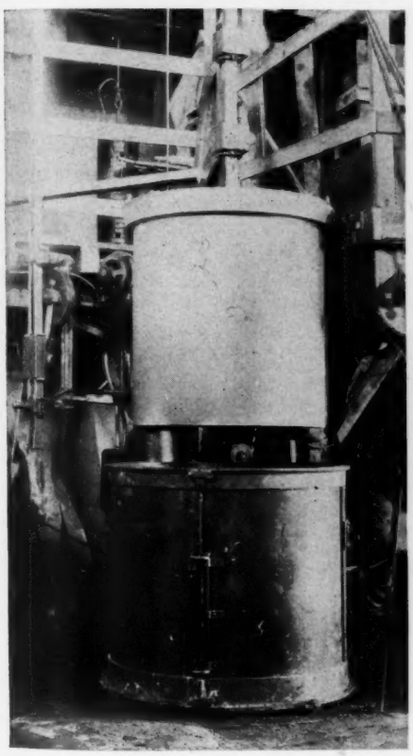
General view of the Saginaw plant

rigid system of inspection and tests is claimed to have resulted in plant savings which prove the factor of inspection is important.

The basic raw materials at Grand Rapids are right at hand. At Saginaw some materials are shipped in from outside points. All raw materials are tested before being accepted.

Uses Electric Power

"We have found electricity extremely flexible," says Mr. Edwards. "The operating costs of electricity, as against coal or coke,



One of the pipe machines

favor electricity. Yet we do not look at the costs alone in the matter, for there is the efficient application of power, the flexibility. For instance, we have 80 individual motors in the two plants; these are direct connected to each unit. By a planned control system we have effected a saving in labor that has been greatly to our advantage. We find fewer employes doing more work, and actually doing it better.

"We operate eight pipe machines for the production of pipe from 4 in. to 72 in. in diameter.

"The pipe machines are built so that the empty molds can be returned and placed on the machines either with traveling cranes or lift trucks. Lift trucks and traveling cranes are also used in carrying the pipe from the machines to the curing kilns. We have eight kilns at Grand Rapids and 12 in the Saginaw plant.

"In reviewing the development of the plant Mr. Edwards gives some interesting angles.

"Looking back hastily, at our progressive steps, we find in chronological order, we manufactured plain sewer pipe 6 in. to 27 in. and 5x8x12 in. building block in 1923. In 1924 we added reinforced concrete sewer and culvert pipe from 10 to 36 in. In 1925 we added 8x8x16-in. block and increased the size of reinforced pipe manufactured to 48 in. In 1926 we added septic tanks and surveyor's monuments. To show how production has changed we found in 1927 our pipe business was coming in such volume it was decided to drop the manufacture of building tile. It was decided that to specialize would be advisable and of more effect. In this same year, 1927, we purchased the pipe plant of the Consolidated Coal Co. at Saginaw. In 1928 both plants were operated by us and catch-basins were added as an auxiliary to the sewer pipe production, with all products being made at both plants.

"The Saginaw plant was started back in 1910 and was the first machine made pipe plant in Michigan. The Grand Rapids plant was the second.

"Capacity production at Saginaw caused us to build a new plant there in 1929. The new plant had a capacity to make all sizes of plain pipe and drain tile, also reinforced pipe from 10 in. to 72 in., and we added at this time 54-in. and 60-in. reinforced to the production at Grand Rapids. We have since added drain tile to production in Grand Rapids; Saginaw has made drain tile since 1917. In 1931 manhole block was added to complete the list of products."

In viewing the past record of each plant Mr. Edwards considers that there had been a steady march of progress. There have been some outstanding "big" jobs, of course, yet consistent attention to the specialized products and keen determination to satisfy the demands and create new sales have proved to be a wise course.

"When we look back into history and find how the ancient Romans used concrete that stands today; when we recall the San Francisco earthquake and remember how those reinforced concrete superstructures stood the "gaff"; when we apply our own research and tests to concrete, the use of cement, sand and gravel, and compare costs and permanency of the jobs, we can readily realize how the concrete pipe and tile business *must* forge ahead."

In regard to transportation and distribution, Mr. Edwards explains: "Today we have 10% railroad haulage, as compared to 90% truck haulage. Why? Because trucks can and *do* equalize railroad freight rates in the first place, and in the second place, we can best illustrate our findings by saying we have a highway job between Battle Creek and Kalamazoo or other points. The railroad is forced to make station delivery; the truck delivers right to the job. That is modern 'delivery service.' We ship by truck over a 100-mi. radius; this covers, practically, our trading area, with Saginaw on the east and Grand Rapids on the west as production points. Freight shipments are made to the upper peninsula.

End view of one of the curing rooms

How Orders Are Secured

The Lamar Pipe and Tile Co. sells unreinforced sewer pipe through local dealers, generally. Reinforced culvert and sewer pipe are sold direct to the contractors. "We naturally keep in close contact with all contractors and the jobs going on in the territory," says Mr. Edwards. "We guarantee our product, and by keeping on the firing

line manage to secure our share of business. It entails constant thinking, with planning, for there are always new problems arising. We must exercise some degree of engineering skill; we are often forced to figure with engineers and contractors on special products and projects. By being able to give practical advice and specific aid, we have made *friends* as well as customers."

But the Lamar Pipe and Tile Co. is doing more than merely producing pipe. Its efforts are assisting to boost the upward trend and progress of the entire concrete products industry of the nation. It carries on with the firm resolve that the best is none too good.

What Home Loan Bank Act Can Do for Construction

OF VERY GREAT interest and significance to the construction materials industry is the Federal Home Loan Bank Act recently signed by the President. It provides for a system of 8 to 12 regional banks, capitalized at $125,000,000, all of which may be subscribed by the U. S. Treasury. The capital of each bank is to be not less than $5,000,000.

To be eligible for rediscount the home mortgage must not have a longer term than 15 years; the value of the home (and real estate) must not exceed $20,000; the mortgage to be accepted must not be more than six months past due. On the security of these mortgages the banks may issue bonds, debentures, etc., on which the bank may fix the rate of interest and sell to investors or otherwise use. These bonds, etc., are exempt from all ordinary taxation, which puts them on a par with governmental securities.

The purpose of the act, of course, is to make home mortgages far more liquid than they have ever been before. Hence it will be much easier and simpler to finance the construction of small homes by the ordinary man. There is every reason to believe that with a return to anything like security of position and earning power the new act will tremendously stimulate residential building.

Federal Aid Road Construction Increases in June

THE mileage of Federal-aid roads under construction June 30 showed a sharp increase over May 31, while the mileage approved for construction but on which work has not yet started declined somewhat, according to a tabulation of the status of Federal-aid road work made public July 19 by the Bureau of Public Roads, Department of Agriculture.

The balance of Federal-aid road funds available for new projects was reduced about $10,000,000 during June, according to the Bureau. The following additional information was provided:

The Bureau included in its tabulation a new figure showing the percentage of the roads under construction which has been completed. This shows that on the average 64% of the work is done on the projects still being constructed.

The mileage under construction June 30 was 10,511.9, compared with 9733.8 on May 31, and the estimated total cost of the work under construction advanced to $234,042,724 June 30, compared with $219,647,002 May 31.

The mileage approved for construction but on which work has not yet begun was 4076.2 June 30, compared with 4199.9 May 31. The balance of Federal-aid road funds still available for new projects June 30 was $61,720,100, compared with $71,382,727 May 31.

The greatest expansion during June in projects under construction were in Minnesota, where the mileage rose from 378 to 501, with a gain in estimated cost of projects under way from about $8,000,000 to $11,000,000; Missouri, where mileage rose from 182 to 279 and costs from about $4,500,000 to $7,000,000; Pennsylvania, where mileage went from 48 to 181 and costs from about $2,000,000 to $5,000,000; and Wisconsin, where mileage went from 163 to 280 and costs from about $4,500,000 to $7,800,000.

Highway Construction Under New Federal Relief Act

PASSAGE of the Emergency Relief and Construction Act by Congress and its signature by President Hoover insures some measure of early unemployment relief through road construction, declares T. H. Cutler, president of the American Road Builders' Association, in discussing road building activities.

"While the $136,000,000 appropriation for highways is only a small part of the $2,122,000 relief measure, it is probable that road building will be the first work undertaken," stated Mr. Cutler. "Many states have plans ready so that a number of the projects can be begun immediately."

The highway funds provided in the total of $136,000,000 are: $120,000,000 for emergency construction on the federal-aid highway system; $5,000,000 for national forest highways; $5,000,000 for improvement of national forests; $3,000,000 for national park roads, and $2,000,000 for roads through public lands.

In addition to the direct highway appropriation, $300,000,000 is made available for relief and work relief, including highway and street work. This money will be loaned to states, counties and cities by the Reconstruction Finance Corporation on request of governors of states. Since highway and street work is a popular and effective method of providing immediate work relief, a considerable part of this money may be requested by municipalities and counties, Mr. Cutler believes.

"Only a beginning in meeting unemployment conditions can be made with the funds available," according to Mr. Cutler, "but such relief will be widely distributed throughout the country. The provision permitting cities to use the relief funds for street work, and the fact that the relief funds do not have to be matched with local money, assures considerable municipal highway work. Restrictions as to the amount of federal participation per mile also have been removed.

"Employment benefits will not be confined to the workers on the roads directly, but will extend to those working in factories, plants and mines producing road equipment and materials, and also on transportation lines conveying them.

"Because no part of the emergency highway funds must be matched by an equal amount from the states, regular state funds are released for new projects. The emergency federal-aid money will be used in lieu of state money to match regular federal aid in a number of states. Additional new work will be created through the releasing of federal-aid allotments in states that lack the necessary state funds to cover regular federal aid promptly."

The emergency highway appropriation will be distributed to the states in accordance with the regular federal-aid requirements on the basis of population, area, and mileage of post roads. The amount of money each state will receive, as computed for the Congressional hearings, is as follows:

Alabama	$ 2,550,053
Arizona	1,762,636
Arkansas	2,091,431
California	4,669,711
Colorado	2,255,281
Connecticut	779,324
Delaware	600,000
Florida	1,629,204
Georgia	3,120,191
Idaho	1,508,485
Illinois	5,077,245
Indiana	3,060,266
Iowa	3,173,493
Kansas	3,276,334
Kentucky	2,259,648
Louisiana	1,740,196
Maine	1,070,600
Maryland	1,015,296
Massachusetts	1,712,774
Michigan	3,783,179
Minnesota	3,373,560
Mississippi	2,160,628
Missouri	3,761,014
Montana	2,525,108
Nebraska	2,557,683
Nevada	1,578,025
New Hampshire	600,000
New Jersey	1,659,121
New Mexico	1,962,340
New York	6,057,965
North Carolina	2,890,203
North Dakota	1,940,325
Ohio	4,501,069
Oklahoma	2,893,101
Oregon	1,996,128
Pennsylvania	5,261,052
Rhode Island	600,000
South Carolina	1,666,492
South Dakota	2,002,076
Tennessee	2,609,757
Texas	7,668,024
Utah	1,387,190
Vermont	600,000
Virginia	2,258,196
Washington	1,905,627
West Virginia	1,316,720
Wisconsin	2,992,438
Wyoming	1,540,811
Hawaii	600,000
Total	$120,000,000

Effect of Emergency Relief Legislation on Construction

THERE ARE THREE major divisions or topics considered in the "Emergency Relief and Construction Act of 1932," now the law of the nation. These divisions are: (1) Relief of destitution; (2) loans by the Reconstruction Finance Corp.; (3) public works.

(1) For relief of destitution 300 million dollars is provided for loans to the states by the Reconstruction Finance Corporation, not more than 15% of the entire sum to be loaned to any one state. These loans are to bear interest at 3%, and if not repaid by July 1, 1935, annual deductions will be made from the federal aid highway funds allotted to the states. The amount of federal aid fund deducted annually to liquidate the loan will be one-fifth of the total allotted the delinquent state. The states may in turn loan the money to cities or other political subdivisions; the amount of such loans is *not* to be deducted from federal aid state road funds, as provided above, but becomes a direct obligation of the municipality to the R. F. Corporation.

(2) The sum of $1,500,000,000 is provided the Reconstruction Finance Corp. to make loans to (1) states, municipalities and political subdivisions of states, municipalities, etc., to aid in financing projects which are self-liquidating in character; (2) to corporations to provide self-liquidating housing projects for families of low income; (3) to private corporations "for construction, replacement or improvement of bridges, tunnels, docks, viaducts, water works, canals and markets devoted to public use and which are self-liquidating in character"; (4) to private corporations for reforestation; (5) to aid "in financing the construction of any publicly-owned bridge to be used for railroad or highway where tolls, fees or rents are collected.

In all the foregoing construction work no convict labor is to be directly employed, and so far as practicable a 30-hour week is to be used for labor, with preference to the employment of ex-service men with dependents. All loans for construction are to be secured by adequate collateral and the R. F. Corporation has the power to liquidate such collateral if necessary. The loans are for a period of three years only, but may be extended five years. No loan is to extend beyond ten years.

(3) Funds for federal public works are provided to the amount of $322,224,000; of which $120,000,000 is appropriated immediately for federal-aid highways, apportioned to the states in accordance with the federal-aid act, which must be utilized before July 1, 1933. The states may or may not match the federal-aid appropriation (under the federal-aid act they would be compelled to). These advances are to be repaid over a period of ten years, beginning July 1, 1938, by making annual deductions from regular federal aid appropriated after that date. The highway contracts made with funds from this loan must establish minimum wage scales for both skilled and unskilled labor. An additional $16,000,000 is provided for highways and trails in national forests and parks.

For federal river and harbor projects $30,000,000 is made available; for flood control, $15,500,000; for the Hoover dam, $10,000,000; for air navigation facilities, $500,000; for U. S. Navy construction projects, $10,000,000; for emergency construction of public building projects outside the District of Columbia, $100,000,000; for construction at military posts, $15,164,000; all the foregoing are authorized but are not to be undertaken unless the money is available or can be obtained by the Treasury upon reasonable terms. In addition to the above, $7,436,000 is provided for airports and aids to aerial navigation.

All readers are urged to secure a copy of the act, as in it are listed all of the individual projects referred to in the preceding paragraph. This will give them first-hand information in regard to forthcoming work.

Deductions from Future Federal Aid

There has been objection raised in some quarters to the provisions for deducting state loans and the emergency federal aid for highways from future appropriations under the federal-aid act. Such objections place the objectors in the position of wanting to "keep their cake and eat it too." The deductions are not to begin until 1935 under the state loan part of the act, and not until 1938 under the federal-aid highway part of the act—and then to extend *over ten years.* This can be construed as a guarantee that federal aid for highways *will extend* 15 *years.* There was no assurance before that it would not be dropped at any time by Congress. Moreover, it is rather far fetched to worry about federal aid three or five years hence. If we are any kind of optimists we believe the economic picture will change considerably in three years. What is needed is funds for highway work this year and next. We have them in the present act.

Comment on Relief Act

"THE Emergency Relief and Construction Act, which went on the statute books after a bitter struggle replete with sensational though trivial incidents, is in every respect the most momentous piece of legislation of the present era, says an editorial in *Engineering News-Record,* which continues:

"The act represents a supreme effort of the nation to correct the human ills and distress arising from business breakdown. In this aspect it is a compromise between charity relief and public-works relief; the long contest between construction and dole ended in a draw. Back of this outcome lay the fact that through long neglect the need for relief had become so pressing as to demand immediate attention, while at the same time the progressive disappearance of construction was too obvious a factor in business disintegration to be ignored. There was sharp clash between divergent views as to how the economic upset might be rectified—between rock-ribbed conservatives who advocated a dole and liberals who held to self-recovery through employment; between those who approached the problem by way of the stock and bond market and those who thought in terms of human productive power.

"Briefly, the act provides 300 millions for charity loans to the state, 1500 millions for loans to promote local public works and housing, these two to be administered by the Reconstruction Finance Corporation, and 322 millions of Treasury funds for federal construction. Provision is also made for direct Federal Reserve loans to private business. The federal construction clause includes two items of very special importance to engineers: a 120 million dollar emergency highway loan fund, and 10 million for Hoover dam, which latter assures early turning of the river; these provisions, by preventing the paralysis of countrywide construction activities, will help powerfully to steady the course of business and will keep hundreds of thousands of men at work.

Action Depends on Initiative

"Outstanding features of the construction loan clauses are the wide discretion vested in the R. F. C. and the restriction of public-works loans to *self-liquidating* projects. As to the former, the whole effectiveness of the act may be said to hinge on the attitude taken by the corporation; if it looks on the loans as the present-day banker does, little employment may result, but it will probably be distinctly more liberal. As to the self-liquidating restriction, a radically new principle is set up, of extensive future as well as present import.

"'Self-liquidating' obviously implies that revenue shall be collected and shall be pledged against costs. This will make the act apply to toll bridges, benefit-assessment work, housing, and occasional utility and special services. Apparently it covers waterworks and highways only when their revenues are expressly pledged. Through this restriction the act may have far-reaching effects on city accounting and revenue practices. Some proposals for segregation of revenue and imposition of special charges have in fact already been made. Earliest action is likely in respect to placing water-supply service on a self-contained basis.

"In itself, of course, the law does little to create employment. What practical results it will achieve depend altogether on the energy, wisdom and speed of local governments—aided by their engineering groups, we trust—in developing their self-liquidating projects, obtaining loans for them, and putting construction under way. Every project of the kind needs to be mobilized at once, for the country is ready to go to work."

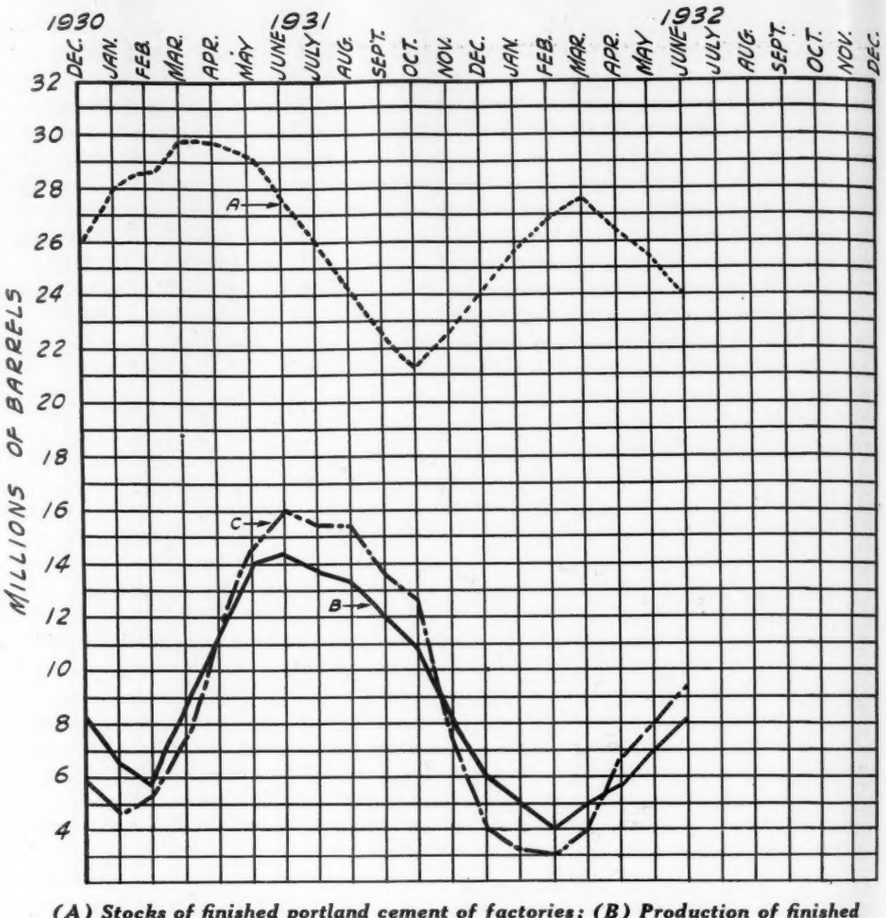
Portland Cement Production, June

THE PORTLAND CEMENT INDUSTRY in June, 1932, produced 7,921,000 bbl., shipped 9,264,000 bbl. from the mills, and had in stock at the end of the month 24,051,000 bbl. Production of portland cement in June, 1932, showed a decrease of 43.9% and shipments a decrease of 42.4% as compared with June, 1931. Portland cement stocks at mills were 12.9% lower than a year ago. The total production for the first half of 1932 amounts to 34,156,000 bbl., compared with 60,133,000 bbl. in the same period of 1931, and the total shipments for the first half of 1932 amount to 34,304,000 bbl., compared with 58,419,000 bbl. in the same period of 1931. The statistics here given are compiled from reports for June, received from the Bureau of Mines, from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of June, 1932 and of June, 1931. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	June		May	April	Mar.
	1931	1932	1932	1932	1932
	Pct.	Pct.	Pct.	Pct.	Pct.
The month	65.4	35.7	30.2	24.8	21.3
12 months ended	55.2	36.5	38.9	41.7	43.8


1930
1931
1932
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4
A
B
C

(A) Stocks of finished portland cement of factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during April and May, 1931 and 1932.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN APRIL AND MAY, 1931 AND 1932, IN BARRELS*

Shipped to	1931—April—1932		1931—May—1932	
Alabama	219,593	44,565	183,572	26,007
Alaska	1,153	524	946	2,259
Arizona	47,083	15,893	42,634	15,430
Arkansas	183,121	14,534	187,370	17,496
California	653,624	455,498	628,900	400,264
Colorado	70,204	61,974	124,139	60,878
Connecticut	150,380	94,490	176,666	114,826
Delaware	32,856	28,895	47,276	38,984
District of Columbia	119,153	97,351	130,588	94,829
Florida	61,526	39,674	82,852	33,183
Georgia	182,817	82,155	156,532	93,256
Hawaii	20,849	29,953	25,580	26,370
Idaho	21,558	12,480	19,917	10,963
Illinois	717,468	335,544	882,739	703,571
Indiana	256,697	157,969	411,373	310,262
Iowa	309,768	145,776	611,996	182,684
Kansas	184,369	126,952	328,414	127,362
Kentucky	197,013	90,728	231,958	127,033
Louisiana	277,366	58,675	314,748	79,682
Maine	36,091	26,384	54,690	36,870
Maryland	181,752	140,479	199,360	168,539
Massachusetts	279,032	209,812	323,576	249,071
Michigan	395,559	179,013	659,977	304,783
Minnesota	268,765	164,514	468,010	384,504
Mississippi	53,159	25,123	82,827	14,928
Missouri	406,831	250,745	511,513	442,725
Montana	24,187	18,034	30,139	12,840
Nebraska	131,416	68,633	237,284	71,205
Nevada	11,722	36,163	10,999	47,891
New Hampshire	30,884	23,710	42,169	20,082
New Jersey	484,331	297,700	557,649	354,171
New Mexico	30,751	24,577	42,604	20,550
New York	1,527,913	970,867	2,013,197	1,095,796
North Carolina	123,303	55,225	146,249	52,396
North Dakota	35,616	19,740	43,024	22,113
Ohio	491,647	310,376	668,196	392,409
Oklahoma	244,250	123,596	301,925	124,276
Oregon	105,653	71,357	104,620	58,860
Pennsylvania	697,081	427,501	801,763	450,430
Porto Rico	2,825	5,645	3,905	4,875
Rhode Island	73,310	31,523	81,320	37,208
South Carolina	234,756	55,309	256,625	43,529
South Dakota	56,775	27,070	77,241	20,924
Tennessee	151,183	98,855	158,104	103,203
Texas	524,419	403,806	597,840	358,964
Utah	31,633	15,997	30,513	16,116
Vermont	22,391	15,312	24,529	25,911
Virginia	162,050	86,856	183,752	88,465
Washington	211,323	163,168	276,386	199,080
West Virginia	92,214	65,620	128,383	86,484
Wisconsin	288,648	176,417	431,564	227,413
Wyoming	13,920	7,547	17,243	10,626
Unspecified	19,876	24,551	12,082	7,406
	11,151,864	6,514,855	14,167,458	7,983,982
Foreign countries	32,136	21,145	32,542	36,018
Total shipped from cement plants	11,184,000	6,536,000	14,200,000	†8,020,000

*Includes estimated distribution of shipments from three plants in April, 1932, and May, 1931 and 1932; from four plants in April, 1931. †Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production—1932		Stocks at end of month 1931	1932	Month	1931—Production—1932		Stocks at end of month 1931	1932
January	8,129,000	6,107,000	10,384,000	8,184,000	July	12,246,000	.....	10,209,000	.....
February	7,473,000	5,176,000	11,946,000	9,375,000	August	11,664,000	.....	8,468,000	.....
March	9,586,000	5,443,000	13,318,000	10,025,000	September	10,414,000	.....	6,918,000	.....
April	11,540,000	5,924,000	13,854,000	10,511,000	October	9,825,000	.....	6,021,000	.....
May	13,159,000	*6,273,000	13,087,000	*9,922,000	November	8,259,000	.....	6,215,000	.....
June	12,679,000	6,803,000	11,837,000	8,857,000	December	6,840,000	.....	7,035,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JUNE, 1931 AND 1932, AND STOCKS IN MAY, 1932, IN BARRELS

District	Production 1931—June—1932		Shipments 1931—June—1932		Stocks at end of month 1931	1932	Stocks at end of May, 1932*
Eastern Penn., N. J. & Md.	2,900,000	1,389,000	3,260,000	1,747,000	6,465,000	5,150,000	5,508,000
New York and Maine	1,230,000	822,000	1,360,000	917,000	1,914,000	1,697,000	1,792,000
Ohio, West'n Penn., W. Va.	1,505,000	645,000	1,507,000	785,000	3,511,000	2,889,000	3,029,000
Michigan	919,000	544,000	1,030,000	676,000	2,372,000	2,080,000	2,211,000
Wis., Ill., Ind. and Ky.	1,757,000	1,128,000	2,220,000	1,419,000	3,915,000	3,271,000	3,561,000
Va., Tenn., Ala., Ga., Fla., La.	1,312,000	603,000	1,463,000	532,000	1,479,000	1,830,000	1,759,000
East'n Mo., Ia., Minn., S. D.	1,300,000	1,103,000	1,917,000	1,320,000	3,244,000	3,218,000	3,435,000
West'n Mo., Nebraska, Kansas, Oklahoma and Arkansas	1,187,000	563,000	1,303,000	637,000	1,710,000	1,269,000	1,344,000
Texas	634,000	335,000	693,000	324,000	675,000	695,000	685,000
Colo., Mont., Utah, Wyo., Ida.	298,000	157,000	278,000	128,000	629,000	407,000	378,000
California	745,000	464,000	737,000	590,000	1,113,000	975,000	1,101,000
Oregon and Washington	331,000	168,000	309,000	189,000	575,000	570,000	591,000
	14,118,000	7,921,000	16,077,000	9,264,000	27,602,000	24,051,000	25,394,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production—1932		1931—Shipments—1932		Stocks at end of month 1931	1932
January	6,595,000	5,026,000	4,692,000	3,393,000	27,759,000	25,778,000
February	5,920,000	3,971,000	5,074,000	3,118,000	28,612,000	26,657,000
March	8,245,000	4,847,000	7,192,000	3,973,000	29,676,000	27,545,000
April	11,245,000	5,478,000	11,184,000	6,536,000	29,715,000	26,496,000
May	14,010,000	*6,913,000	14,200,000	*8,020,000	29,554,000	*25,394,000
June	14,118,000	7,921,000	16,077,000	9,264,000	27,602,000	24,051,000
July	13,899,000	.....	15,545,000	.....	25,934,000	.....
August	13,549,000	.....	15,172,000	.....	24,313,000	.....
September	12,092,000	.....	13,671,000	.....	22,736,000	.....
October	10,762,000	.....	12,360,000	.....	21,218,000	.....
November	8,161,000	.....	7,156,000	.....	22,219,000	.....
December	5,974,000	.....	4,142,000	.....	24,098,000	.....
	124,570,000	.....	126,465,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN JUNE, 1931 AND 1932, IN BARRELS

District	1931—Production—1932		Stocks at end of month 1931	1932
Eastern Pennsylvania, New Jersey and Maryland	2,660,000	1,456,000	1,731,000	1,079,000
New York and Maine	1,021,000	625,000	1,212,000	760,000
Ohio, Western Pennsylvania and West Virginia	1,271,000	458,000	1,402,000	825,000
Michigan	623,000	515,000	1,415,000	1,213,000
Wisconsin, Illinois, Indiana and Kentucky	1,533,000	809,000	1,490,000	1,004,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,274,000	445,000	709,000	414,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,145,000	998,000	930,000	611,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	1,143,000	541,000	695,000	789,000
Texas	702,000	280,000	270,000	284,000
Colorado, Montana, Utah, Wyoming and Idaho	297,000	174,000	280,000	146,000
California	754,000	372,000	1,364,000	1,498,000
Oregon and Washington	256,000	130,000	339,000	234,000
	12,679,000	6,803,000	11,837,000	8,857,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	1931—Exports—1932 Barrels	Value	Barrels	Value	1931—Imports‡—1932 Barrels	Value	Barrels	Value
January	41,199	$ 115,678	36,704	$ 82,984	95,609	$ 120,298	14,375	$ 16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	30,123	69,451	53,333	58,576	59,392	41,487
May	48,028	140,953	31,634	71,048	19,325	20,568	9,223	7,358
June	43,597	107,610	.....	.....	32,079	42,955	.....	.....
July	29,344	97,837	.....	.....	14,332	15,582	.....	.....
August	39,517	106,643	.....	.....	8,895	11,739	.....	.....
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
	429,653	$1,220,600	.....	.....	457,238	$ 507,918	.....	.....

Exports* and Imports†

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN MAY, 1932

Exported to	Barrels	Value
Canada	880	$ 3,283
Central America	16,896	23,143
Cuba	711	1,892
Other West Indies	425	1,093
Mexico	2,968	8,554
South America	8,638	27,892
Other countries	1,116	5,191
	31,634	$71,048

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS IN MAY, 1932

Imported from	District into which imported	Barrels	Value
Canada	Maine and New Hampshire	40	$ 120
Denmark	Porto Rico	7,558	5,870
Japan	Hawaii	1,625	1,368
	Total	9,223	$7,358

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN MAY, 1932

	Barrels	Value
Alaska	1,826	$ 4,801
Hawaii	36,313	76,730
Porto Rico	7,972	10,347
	46,111	$91,878

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡Includes hydraulic cement clinker, and white nonstaining portland cement.

State Cement Plant Reports Loss

THE South Dakota state cement plant at Rapid City operated at a loss of $25,605.19 for the first six months of 1932, a report filed with the secretary of state by the cement commission reveals. Non-operating credits of $1,604.33 reduced the loss to $24,000.86.

Gross sales during the period amounted to $206,650.91, the report showed. Net sales totaled $90,093.22. Manufacturing costs totaled $102,632.90, selling costs were $13,057.29, and general administration cost $3,008.22.

Despite the loss for the six-month period, the plant is in good financial condition, the report indicated. The balance sheet showed cash items of $173,562.38, inventories of $334,366.75, fixed assets of $1,638,642.48, and other assets of $851,065.93.

The principal "other asset" is a credit of $850,000 in cash which the plant has returned to the state treasury since it began operations in 1925.—*Sioux Falls* (S. D.) *Argus-Leader.*

Acts to Prevent Transfer of Assets

A HEARING on the application of F. A. Ontjes for a temporary injunction enjoining the officers of the company from making a transfer of assets of the Northwestern States Portland Cement Co. of West Virginia to the Iowa corporation as voted by the stockholders two years ago was to be heard July 14 in the district court.

The application for the injunction was filed Tuesday afternoon by Mr. Ontjes, apparently after receiving a communication addressed to the stockholders of the company from Peter Anderson, secretary, stating that transfer of the assets from the West Virginia to the Iowa company would now take place.—*Mason City* (Ia.) *Gazette.*

Ash Grove Improves Chanute Plant

A NEW SYSTEM of clinker cooling has just been completed at the Chanute, Kan., cement plant of the Ash Grove Lime and Portland Cement Co. Many other improvements and repairs have been made at the plant in recent months, Guy O. Gardner, superintendent of the plant, has reported.

According to the *Chanute Tribune,* it is the plan of the company to defer opening this plant for another three months, after which it is hoped that continuous operation throughout the winter may be maintained.

Report on Accidental Injury Rates in 1931

A REPORT on the accidental injury rates in the cement mining and quarry industries for 1931 has been issued by the statistical bureau of the National Safety Council, Chicago, Ill. The report summarizes the experience of members of the National Safety Council in these industries and also includes other accidental injury data available from cooperating individuals and organizations.

Directors of the National Crushed Stone Association Meet

IN ACCORDANCE with an annual custom of long standing, the board of directors of the National Crushed Stone Association held a two-day session at Atlantic City, N. J., July 15 and 16.

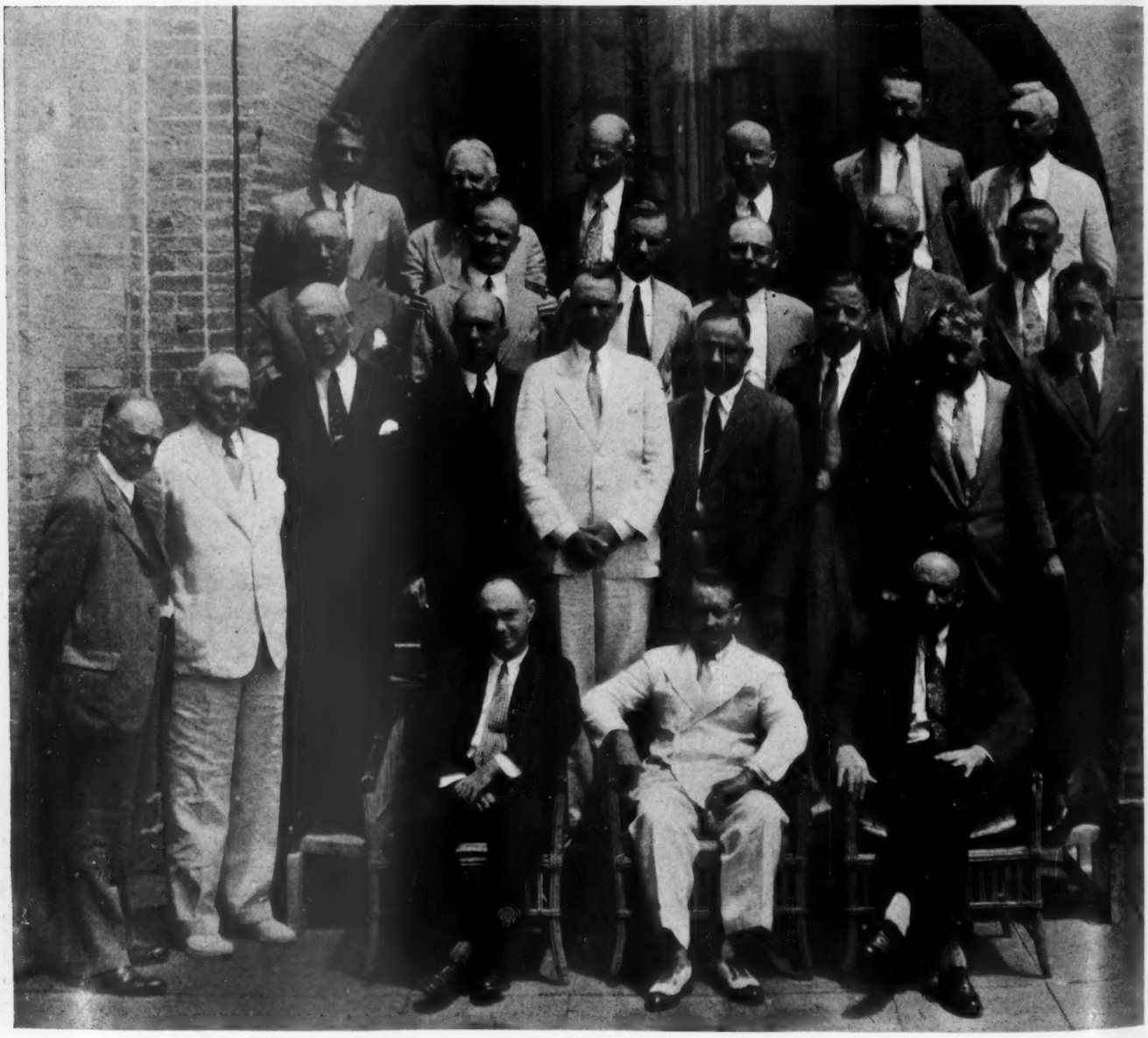
The directors went over the financial condition and outlook of the association in detail and provided for a continuation of all present activities. The place and time of the next annual convention were determined, but for reasons of policy, not announced.

The research activities of the association were discussed and the policies approved. Various factors in the present business situation were discussed and the desirability of united action by all interests dealing with highway construction was discussed.

While it can hardly be said that a spirit of optimism prevailed, it can be honestly reported that there was a general feeling that the worst was over, and that there was still business enough in most localities to earn some profit.

The following directors were present: A. L. Worthen, president (Connecticut Quarries Co., New Haven, Conn.); W. M. Andrews (Lake Erie Limestone Co., Youngstown, Ohio); L. J. Boxley (W. W. Boxley and Co., Roanoke, Va.); F. O. Earnshaw (Carbon Limestone Co., Youngstown, Ohio); O. M. Graves (General Crushed Stone Co., Easton, Penn.); F. T. Gucker (John T. Dyer Quarry Co., Norristown, Penn.); W. E. Hillard (New Haven Trap Rock Co., New Haven, Conn.); A. S. Lane (John S. Lane and Son, Inc., Meriden, Conn.); Bernard A. McKinney (West Roxbury Trap Rock Co., West Roxbury, Mass.); Thos. McCroskey (American Limestone Co., Knoxville, Tenn.); John Prince (Stewart Sand Co., Kansas City, Mo.); Russell Rarey (Marble Cliff Quarries Co., Columbus, Ohio); John Rice (General Crushed Stone Co., Easton, Penn.); J. A. Rigg (Acme Limestone Co., Alderson, W. Va.); F. W. Schmidt (Morris County Crushed Stone Co., Morristown, N. J.); T. I. Weston (Weston and Brooker Co., Columbus, S. C.); directors representing the Manufacturers' Division of the Association: Abe Goldberg, Allis-Chalmers Manufacturing Co., Milwaukee, Wis., and L. W. Shugg, General Electric Co., Schenectady, N. Y.

Among the guests present were J. Barab (Hercules Powder Co.); P. B. Reinhold (Reinhold and Co., Pittsburgh, Penn.), chairman of the association's research committee; H. M. Rigg (Acme Limestone Co., Alderson, W. Va.); Harold Williams (general counsel of the General Crushed Stone Co., Boston, Mass.); J. R. Boyd, secretary, and A. T. Goldbeck, chief of the bureau of engineering, of the association.



Group of directors and guests of the National Crushed Stone Association, Atlantic City, N. J., July 15, 1932

Wall Street Comments on Cement Price Increases

THE WIDE INTEREST and tacit approval of the recent increases in quotations for portland cement are illustrated by the following article from the *Wall Street Journal*, New York City, leading financial newspaper of this country. The article in full (including the box insert) follows:

"The Missouri Portland Cement Co. has increased price of cement 30 c. a barrel, to $1.15. Several producers in Illinois have made similar increases, while cement in Kansas City is currently quoted at $1.25 a barrel. Price at Kansas City was increased to $1.25, from 75 c., last month.

First Important Rise Since 1929

ADVANCE of from 30 to 50 cents a barrel for cement in the Middle West is the first price increase of consequence since 1929. For the two years preceding early 1931, the cement trade was in a chaotic condition as the result of price shading and secret concessions. In May last year the final cut occurred, bringing prices to the lowest level in 15 years.

Since that time quotations have become increasingly firmer as producers saw the folly of taking non-profitable orders simply to keep their mills going.

Reflecting the better feeling of producers as regards future profits, cement securities have been moving upward recently. International Cement, one of the most active cement stocks on the New York Stock Exchange, at its close Wednesday of 9 was up 5 3/8 points from the low of the year, and its bonds had advanced 7 points to 49.

"Portland cement producers in the East are hopeful that the recent price increase of from 30 c. to 50 c. a barrel in the Middle West will in time react favorably on quotations in this territory. A more hopeful feeling has existed in the industry for some months despite a continued decline in demand. This feeling is the result of a more stable price structure caused by a stricter adherence to the list price by the great majority of producers. In the past prices were practically disregarded by many manufacturers in their efforts to get orders to keep their mills running at the highest possible capacity.

"Current prices, which have been in effect since May, 1931, are at their lowest point in 15 years.

"Toward the close of 1930 as the culmination of two years of declining demand and keen competition, the most severe price war in the history of the industry broke out. Five cuts were made in the initial five months of 1931, the quotation in New York City declining 40 c. to $1.54 a barrel packed in paper containers and less all discount. The Chicago price declined by 46 c. to $1.40 a barrel and the Albany price declined by 50 c. to $1.58 a barrel.

"The cement industry is operating at the lowest level in many years. During June the ratio of production to capacity was 35.7% as compared with 65.4% in 1931, while for the 12 months ended with June the ratio was 36.5% as compared with 55.2% in 1931. Last month 7,921,000 bbl. were produced, while shipments amounted to 9,264,000 bbl. Stocks on hand aggregated 24,051,000 bbl., the lowest point since the close of the preceding November. At the end of June, 1931, stocks totaled 27,602,000.

"Production last month represented a decrease of 43.9% with shipments 42.4% lower than a year ago. Production in the first six months of the current year amounted to 34,156,000 bbl. as compared with 60,133,000 bbl. in the similar period of 1931. Shipments amounted to 34,304,000 bbl. compared with 58,419,000 bbl. in 1931.

"Following table shows the 1932 high and low prices of the leading cement securities and their closing quotations Wednesday (July 20) with the change for the day:"

Bonds:	High	Low	Wed. Close	Chg.
International Cement 5's, '48	70	42	49	+ 2
North American Cem. 6½'s, '40	26¾	11½	13	.....
Stocks:				
International Cement	18¼	3⅝	9	+ 1
Alpha	10	4½	5⅞	+ 1⅛
Lehigh	6½	3⅝	6¼	.....
Pennsylvania-Dixie	1⅜	½	¾	+ ¼

Would Obtain Legal Right to Production Curtailment Agreement

PRESIDENT HOOVER has invited Governor Julius Meier of Oregon to institute a test suit in connection with the proposed distribution agreement of lumber producers in Oregon and Washington, Senator Steiwer (Rep., Ore.) revealed after urging the chief executive's support to the agreement.

Mr. Steiwer declared that the President is sympathetic with the joint distribution proposal, but his hands are tied by existing anti-trust laws

The senator let it be known that the attorney general will cooperate with the lumber interests in the two states if they desire to make a test case of the proposal in court.

The Oregonian recalled that the President in his last two regular messages to Congress urged that the anti-trust laws pertaining to natural resources be somewhat revised in order to prevent waste. Mr. Steiwer declared that about 60% of the timber in the Northwest is going to waste and that the joint distribution proposal is in line with the President's suggestion. He also said it would have a salutary effect on employment.

A similar case, that of the bituminous coal industry, is to come up before a United States court in North Carolina early in August. Appalachian Coals, Inc., organized by certain coal producers in what is known as the high volatile Appalachian coal fields, embracing a part of southern West Virginia, a part of eastern Kentucky, a portion of southwest Virginia and eastern Tennessee, is the organization which will bring suit against the law.

The object of the organization is to act as the common selling agency for all of the stockholders who are coal producers.

As in the case of the lumber industry in the Pacific Northwest, Appalachian Coals officials state that the effort has been brought about by the deplorable condition of the bituminous coal industry as a whole. These conditions have been caused in this industry by a great excess productive capacity, which grew out of the abnormal war demand for coal, along with increased competition by oil, natural gas and electric power.

In commenting on the conditions in the Northwest lumber industry, Senator Steiwer said there had been a complete shutdown in some areas of Washington and Oregon.

"As a temporary expedient," he said, "such an agreement would do a great deal to help out in the employment situation in the two states. President Hoover is very sympathetic with the present conditions in the lumber industry, because he knows how wasteful the lumber industry is. Although the President is interested in this situation, there is nothing he can do about it."—*Wall Street Journal* (New York City).

Commodity Prices Advance

PROFESSOR Irving Fisher's index of wholesale commodity prices continued its rapid advance during the week ended July 22, adding 0.6 to its gain during the month and bringing the total rise to 1.5.

The week's advance equaled the record rise of the preceding period. The upward movement of the index figure now far exceeds any previous rise since July, 1929, both in points and in percentage gain. The largest previous advance was in December, 1929, and January, 1930, when the index rose 1.1.

The present figure of 60.8 compares with 60.2 last week, with low of 59.3 five weeks ago and with average of 69.8 in July, 1931.

Purchasing power of the dollar fell 1.8 during the week to 164.5, compared with 166.3 in the preceding week, high of 168.8 five weeks ago, and average of 143.2 a year ago.

Professor Fisher's wholesale price index is compiled of 200 representative commodities, taken mainly from *Dun's Review*. The average for 1926 is used as a basis for this comparison, and it is therefore placed at 100.0.

Marquette Cement Begins Truck Operation at Cape Girardeau Quarry

Four of the trucks used for quarry transportation and, at right, close-up of loaded truck

STARTING an entirely different type of quarry transportation during the past few weeks, the Marquette Cement Manufacturing Co. has installed five new trucks in the quarry at its Cape Girardeau, Mo., plant. At present the trucks receive the stone from the shovels and transport it up a 12% grade to the primary crusher at the crushing plant. However, a new quarry incline and track are being constructed and when this is completed the trucks will dump to a skip car at the foot of the incline. This will eliminate the long up-grade haul of the trucks to the crushing plant and thus materially speed up their operation and, it is expected, will also prevent excessive wear on the trucks from continued use on the ramp.

In changing to this type of operation, the company expects to obtain greater flexibility in the quarry operation and eliminate any delays. Cars and tracks were formerly used for quarry transportation. At present the quarry floor has been entirely leveled off so that the trucks can move to any part of it.

The trucks that have been placed in use are five new 15-ton Sterling trucks, each fitted with a 10-yd. Easton body. The trucks are of the 6-cyl., 12-speed type and are expected to be able to perform under any conditions that may be met with at the quarry. All are fitted with solid rubber tires to better withstand the hard treatment to which they will be subjected in their work. The type of skip car to be used on the incline is an Easton car with a 12-yd. body.

This unit of the Marquette company is now running regularly and at full capacity. Besides the stone used in the manufacture of cement, the company is also producing crushed stone for commercial use. Most of this goes for road construction, a large portion being shipped by barge to the Illinois side of the Mississippi river for road work near the river. E. M. Gould is the superintendent of the quarry at the Cape Girardeau plant.

H. D. Conkey and Co. Advertises

IN THE WORDS of O. J. Ellingen, vice-president, H. D. Conkey and Co., Mendota, Ill., his company is "advertising again along old-fashioned lines." This consists of the use of blotters with calendars and of pertinent paragraphs of interest to those with whom the company may do business.

One end of quarry and present ramp over which trucks are operated at Cape Girardeau plant

Applying 200 Hp. by Thrustors on a Dragline Scraper Hoist

By A. P. Danz
General Electric Co., New York, N. Y.

TWO HUNDRED HORSEPOWER sounds like a great deal of power to apply by means of a thrustor, but fundamentally that is just what is being done on an installation made last season by the Lidgerwood Manufacturing Co. This company furnished a dragline scraper hoist engine to the Morris County Sand and Gravel Co., Netcong, N. J., equipped with a 200-hp. d-c. motor and two 800-lb. 8-in. stroke thrustors to apply the power to the load.

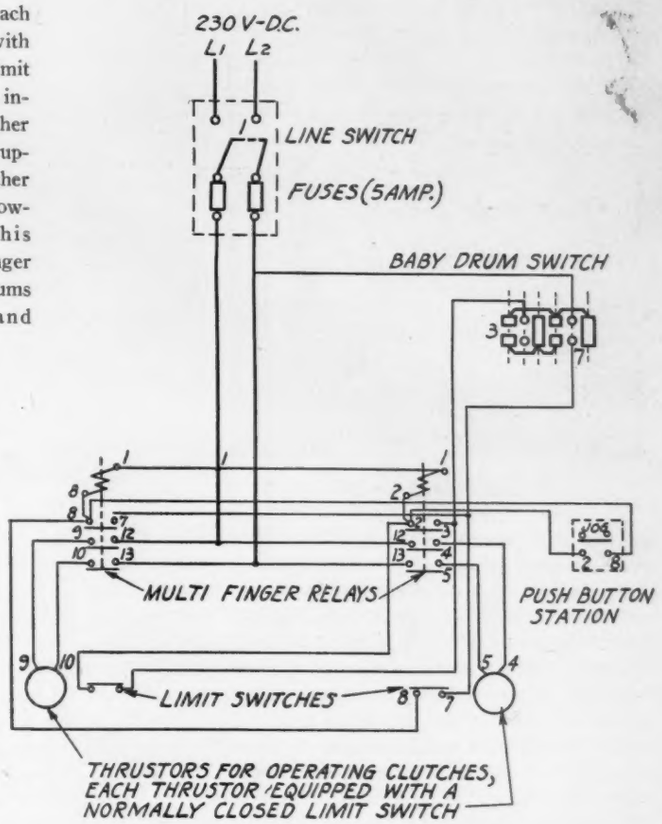
A hoisting engine for this service is equipped with two drums, one for dragging the loaded scraper bucket through the sand up to the dumping position, and the other drum for the reverse operation of pulling in the tail rope which passes out over a sheave at the far end of the sand pit and back to the tail of the bucket so as to pull the scraper bucket back to the original digging position.

Ordinarily the operation of these drums is controlled by two hand levers, alternately throwing in friction clutches to clutch the motor to the drums, the motor running continuously. On this installation the operator is in a pulpit at some height above the hoisting engine, and therefore, to eliminate the long reach rods from the clutches to the pulpit, one thrustor is applied to each clutch and controlled through multi-finger relays by means of a drum switch and a push button.

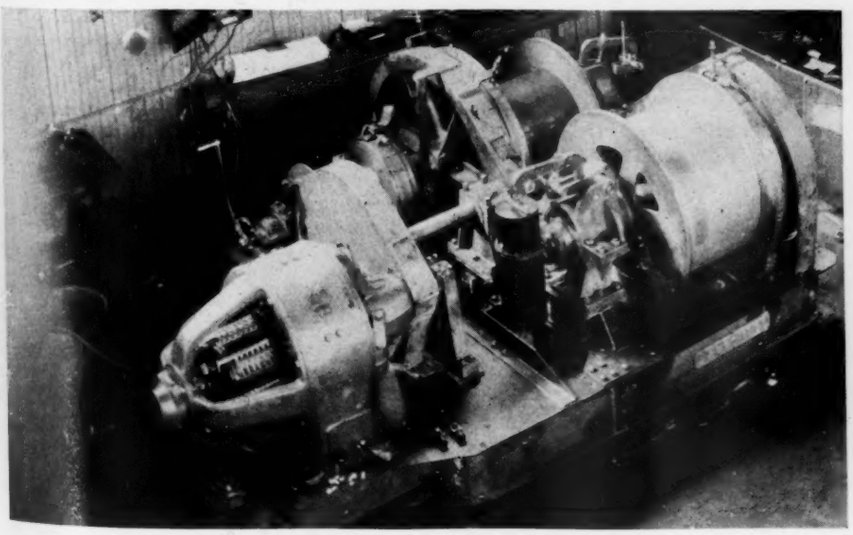
The scheme of operation is shown on the accompanying sketch. From this it will be noted that each thrustor is equipped with a normally closed limit switch used for cross interlocking so that neither thrustor can starts its upward trave until the other has returned to its lowered position. In this way there is no danger of clutching in both drums at the same time and thereby trying to pull the bucket two different ways at once, which would probably result in snapping the rope or tearing the bucket apart.

In normal operation the operator starts the motor by means of a 3-point master switch, controlling a full-magnetic non-reversing panel, after which he forgets all about his motor and simply controls his operations by flipping the baby drum switch back and forward once every half minute. The thrustors do the rest and, as the title implies, they apply the 200 hp. of energy to the bucket alternately forward and reverse.

Occasionally, however, the lip of the bucket will strike a snag, and the bucket will start to up-end. This may happen in either the forward or the reverse travel of the bucket. In either case, however, the operator has merely to press the push button, which short-circuits the cross interlocking and thereby permits the application of the two clutches at the same time. This pulls the tail rope taut (it had been freely paying out) and prevents the bucket from turning over. The operator is expected to use judgment and to use this button as a jog button, since if he continued to hold the button down he would apply full power in both directions at the same time and break something.



Wiring diagram of thrustor control



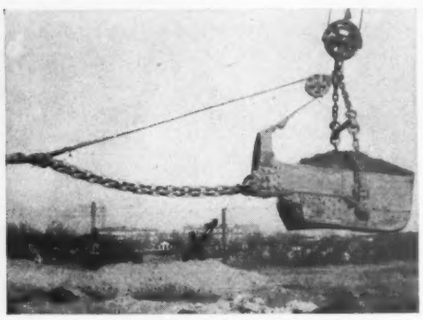
Shop assembly of two-drum hoist with thrustors

Occasionally a boulder is encountered and then it becomes desirable for the bucket to approach it at reduced speed. This is the reason for using a 3-point master controller with a full magnetic panel for primary control of the motor. The operator can simply reduce the speed by means of the master controller, pick up the boulder, and then speed up again. This may not happen, however, once in a full day's operation. Normally the thrustors, operated from a distance, do all the work of controlling the application of this large amount of power to the hoisting drums and do it twice a minute.

New Machinery and Equipment

Dragline Bucket

THE new "Red Arch" dragline bucket (Type X) has recently been announced by Bucyrus-Erie Co., South Milwaukee, Wis. It is a general utility bucket for the average run of dragline work and is built



Reduces dead weight

in sizes from ½- to 8-cu. yd., full measure. Special attention has been given to a design and selection of materials which will give maximum strength and wear with elimination of dead-weight, the manufacturer states. Features include the red arch, a one-piece, annealed steel casting providing great strength without excess weight; a strong, smooth, manganese steel lip with low-cost renewable manganese steel teeth; tooth bases cast into lip; teeth secured with simple wedges; inexpensive, easily replaced runners and wearing plates protecting bottom of bucket.

●

Shunt for Enamel-Wired Blasting Caps

ADOPTION of a new shunt for enamel-wire, electric blasting caps is announced by the Hercules Powder Co., Wilmington, Del.

The new shunt is called the "Wassen" shunt and is made by winding the end wires around a small piece of metal. It is as effective as the old type of twisted ends, and is easier to untwist and take apart without distorting the wires, it is stated. For electric caps with plain iron or copper wires, Hercules will continue to use the eyelet shunt.

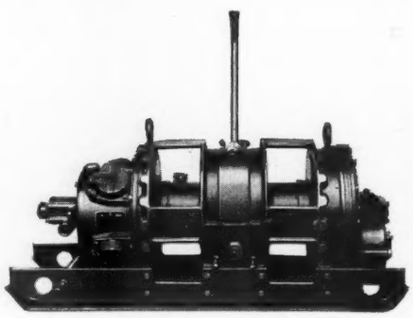
The shunting of blasting cap wires is said to prevent accidental explosions from loose wires coming in contact with a source of electric current. Special care should be exercised when using enamel wires, and particularly wires that have been cut shorter, the announcement added, as all the enamel should be carefully scraped off the ends when hooking up so as to prevent misfires.

Double-Drum Air Hoists

THE Ingersoll-Rand Co., New York, N. Y., announces four sizes of double-drum "Utility" air hoists for application in slushing and scraper loading in mines and quarries, sand and gravel pits, etc., wherever portable double-drum air hoists are required.

A feature of the hoists is the single-lever control of the clutches and throttle valve. Swinging the lever sideways engages the clutch for either of the two drums, and pushing it forward admits air to the motor. The speed of the motor is controlled by the forward position of the lever. Variations in drum speeds are regulated by the lever and without the need of slipping the clutch. It is also claimed that the motor need run only when the hoist is actually pulling. The lever automatically returns to neutral if released—a safety device.

Cylindrical cast-steel housing construction fully encloses and protects the drums,



Simple control feature

clutches and brakes. An internal expanding clutch is provided for each drum, operated by the single lever. The hoist is mounted on steel skids.

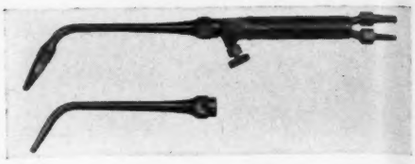
The four sizes are known as the HX, HXC, KX and KXB. The HX has a rated capacity of 1500 lb. pull at 175 ft. per min., while the HXC and KX are rated at 2000 lb. pull at speeds of 130 to 215 ft. per min. respectively at 80-lb. air pressure. The KXB was designed especially for use with low air pressures. It has a rated capacity of 2000 lb. at 140 ft. per min. at 60-lb. air pressure.

●

A New Blowpipe

THE Linde Air Products Co., New York, N. Y., has announced a new welding blowpipe, designated as the Oxweld Type W-22.

The new blowpipe is similar to the Oxweld Type W17 welding blowpipe except that the oxygen and acetylene valves are



Minimizes flashback

located on the front of the handle, so that flame adjustments may be made more readily by the operator while the blowpipe is in operation.

A special feature of the blowpipe is the long acetylene passageway between the acetylene valve and the injector which is said to minimize the possibility of flashback.

The ball-type acetylene valve is another feature of the Type W-22 blowpipe. This type of valve consists essentially of a stainless steel sphere which is hardened and ground with extreme accuracy by a new process. The manufacturer states this sphere eliminates any difficulties which might be caused by the deposition of carbon in the valves.

●

Truck Mixer

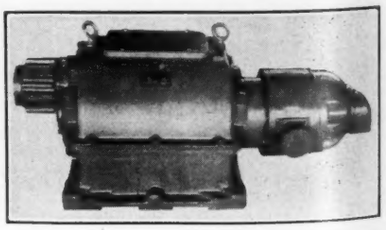
THE Jaeger Machine Co., Columbus, Ohio, announces a truck mixer unit specially designed for highway widening and curb and gutter work. A side discharge is also said to facilitate street construction work. The discharge may be from either side of the truck and is said to discharge from 2½ to 5 cu. yd., the capacity of these mixers, in less than one minute. This feature is claimed to make possible much greater speed on road work, when used in conjunction with Jaeger concrete spreaders. The units are also adapted for general commercial concrete delivery.

●

Motorized Reducer

A NEW motorized speed reducer has been added to the line of enclosed speed reducing units built by the Link-Belt Co., Philadelphia, Penn.

The reducer illustrated is a triple reduc-



Roller bearings are used

tion unit with a speed ratio of 312.2 to 1, being one of a lot of 32 made for driving sludge collectors at New York City's new sewage treatment plant on Ward Island. The motor shaft operates at 1165 r.p.m. and the low speed shaft at 3.75 r.p.m.

Roller bearings and continuous-tooth herringbone gears are used. The gears run in oil. The tabulated ratings will be for continuous duty, allowing for 100% momentary overloads.

•

Announces New Tractor Tire

ANNOUNCEMENT has been made of a new type of high traction tire known as the "Zero Pressure" to meet the needs of tractor service by B. F. Goodrich Co., Akron, Ohio.

It is called "Zero Pressure" because it has cushioning qualities equal to or better than a pneumatic, yet has no air under pressure within the tire, the manufacturer states.

The tire is designed to provide a snowshoe effect in loose or soft soil, or sand, having a tread which deflects readily under load and provides unusual tractive qualities.

This tire consists of a rubber arch built on a slotted steel base for application to solid tire wheels. The piers of the arch are of sufficient size and rigidity to provide ample carrying capacity, it is said.

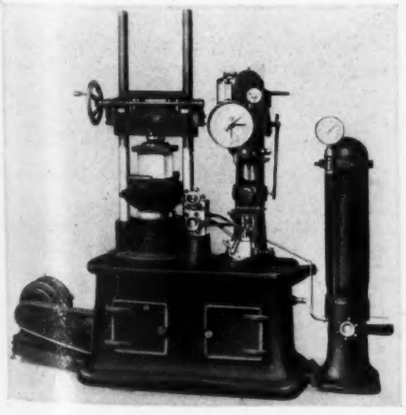
The tire in service assumes a concave tread profile under load. In sand or soft soil, this results in packing the material under the center of the tire, producing a track for the tire to ride on and causing it to ride on top of the loose material rather than dig itself in.

•

Testing Machine

A NEW TYPE of testing machine is announced by the Steel City Testing Laboratory, Detroit, Mich., its Model BP-4, which is adaptable for testing construction materials. This machine is of hydraulic construction, sensitive and accurate, the manufacturer states.

The load weighing is accomplished by means of the pendulum dynamometer, the results being shown on the load indicating dial. The autographic attachment functions direct with the pendulum, giving a permanent record of each test. This machine is supplied in 150 and 300 tons capacities.



Hydraulic testing machine

•

Detachable Bit and Drill Rod

A DETACHABLE BIT and drill rod is announced by its inventor, A. E. Deyo, San Francisco, Calif. This drill rod is made of one piece of drill steel with a standard shank as used on ordinary drill steel and is

Detachable bit of special steel

swedged to a pyramid on the bit end to provide greater strength for coupling and to eliminate fatigue from the shock at this point. By inserting threads on the outside of the tapered pin quick action in detaching the bit is possible. On to this pin the threaded pyramid-shaped socket of bit is screwed. These drill rods are made of a special alloy steel developed to withstand fatigue, the manufacturer states.

The detachable feature, with the wide range in which the bits are furnished, permits quick change where varied rock conditions are encountered.

•

Announces Three New Six-Cylinder Models

MACK TRUCKS, Inc., announces three new six-cylinder trucks, designated as the Models BM, BX and BQ, and covering a range of medium-capacity and heavy-duty, high-speed service.

The three new units have a close resemblance in exterior design. All are characterized by a set-back front axle. A feature now being placed on these new models is a group chassis lubrication system whereby grease is run through tubing from a central point on either side of the frame.

Other mechanical features include use of Mack rubber shock insulators; Mack torque insulator; L-head, flat-seat-valve engine design; renewable alloy exhaust valve seat inserts; nickel-alloy, cast-iron brake drums; full-floating shafts in a one-piece, drop-forged, banjo-type Dual Reduction drive axle.

New Line of Direct Current Motors

A NEW LINE of direct current motors, embodying refinements of design and construction, is announced by the General Electric Co., Schenectady, N. Y. Mechanically, these motors are so designed that many variations, such as different degrees of enclosure for various applications, can be accomplished by using only a few different parts. New and radically different pulley-end shields afford maximum protection to the motor windings. The improved insulation used is resistant to moisture and weak acids, the manufacturer states. In addition, the speeds of all constant-speed motors can be increased 25%, and more in some ratings, by field control.

•

Humidity Cabinet

A HUMIDITY CABINET is announced by the American Instrument Co., Inc., Washington, D. C. This new cabinet is said to provide automatic control of temperature and humidity for aging cement samples in accordance with requirements of the American Society for Testing Materials. Provision is made for storing samples both in moist air and immersed.

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Capacitor Motors

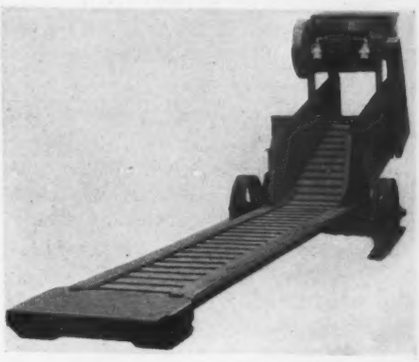
A LINE of capacitor motors, known as type RZH, is announced by the Wagner Electric Corp., St. Louis, Mo. They are condenser-start condenser-run split phase motors, the condenser capacity varied from start to run by means of a switch and an auto transformer.

•

Portable Troughed Belt Feeder

THE Fairfield Engineering Co., Marion, Ohio, announces a portable belt feeder to facilitate unloading of loose bulk materials such as sand, gravel, crushed stone, etc., from hopper-bottom cars. It receives the material as it drops from the hopper, carrying it for further distribution to a portable or stationary conveyor or elevator.

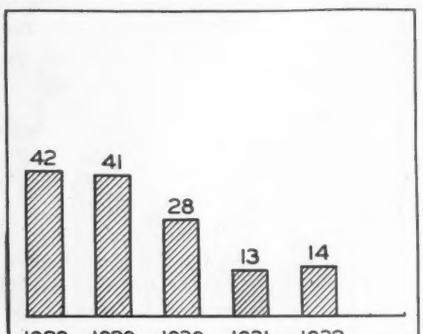
The feeder is 18 in. wide and 14 ft. long, and will unload 100 tons of sand per hour.



For loose, bulk materials

June No-Accident Campaign

FINAL REPORT on the June No-Accident Campaign by member mills of the Portland Cement Association indicates that in respect to the total number of accidents suffered the record is not as good as it was in 1931, but with respect to severity and to the number of mills in which accidents occurred, some improvement is noted. During June, 1932, there were 12 lost-time accidents and two fatalities in the 105 mills enrolled, while for the corresponding month last year there were 10 lost-time accidents and three fatalities in the plants enrolled at that time.



June accidents in cement industry

Only nine mills suffered accident during June, 1932, the smallest number to report mishaps in any of the June campaigns. The following is a condensed description of all accidents reported during the month of June:

Fatalities

Power—Flue-blower slipped off step-ladder, suffering a hernia which resulted fatally four days later.

Burning—Two employes engaged in cleaning dust chamber of kiln head received serious burns when about a ton of hot material was discharged through the clean-out door without warning. One employe succumbed to his injuries.

Lost-Time Accidents

Raw—Employe applying hot belt dressing to moving pulley. Hand caught in pulley, injuries received necessitating amputation of the right arm at the shoulder.

Quarry—Laborer engaged in unloading chain when section of the same fell on foot. Injury necessitated amputation of the second toe.

Packing—Packer struck by falling hand-truck.

Shop—Repairman was working on crane bucket when tool dropped on leg, causing inflammation of same. Five days lost time.

Burning—Laborer while operating pugmill claims he struck his shin against a support. Nine days lost time.

Dust Chambers—Two laborers were engaged in cleaning the dust chambers when hot dust blew from the door, striking them on the feet and legs. One employe jumped from the platform and received a complete fracture of the right arm. Lost time undetermined.

Quarry—Jackhammer man was engaged in drilling when rock on which he was standing became loose, causing him to fall. The loose rock rolled after him and struck him, breaking ribs, bruising head, arms and legs. Lost time, approximately three weeks.

Packing and Shipping—Cement puller was caught in slide of cement stock, which threw him into steel casing of bin entry. Injuries consisted of a 6-in. laceration of his scalp. Lost time is as yet undetermined.

Millwright was using an 8-ft. wooden ladder on an angle of approximately 25 deg. The ladder could not stand the weight when used as a plank. It broke and caused injured to fall 13 ft. Injuries consisted of complete simple fracture of the head.

Crushing—Laborer punching rock in the crusher feeder when his rod became caught and jerked him into the pan feeder. Injuries to his face necessitated three days lost time.

Notwithstanding rather adverse conditions under which the 1932 campaign was conducted, the group as a whole made a better record than previously, a large proportion of the accidents reported occurring in two or three mills. There were a considerable number of mills starting operation about June 1 after a long shutdown. Such conditions often involve severe hazards.

Government Costs, Not Improvements, Should Be Slashed

GOVERNMENT COSTS must be reduced, but in doing so it is highly important to distinguish between wasteful current expenditures and wise capital investment, according to Edward J. Mehren, president of the Portland Cement Association, Chicago, Ill.

Mr. Mehren's views were expressed in a letter to Robert L. Lund, president of the National Association of Manufacturers, which is holding a conference of trade organizations in New York this week to consider means of effecting economies in government.

"There is grave need for reduction in government costs," Mr. Mehren's letter said in part. "Duplicated, overlapping and wasteful functions should be eliminated. The benefits to industry and to the country should be out of all proportion to the energy required.

"It is highly important, however, to distinguish between wasteful current expenditures and wise capital investment. The latter creates employment, is not competitive with private industry, and if truly wise, finds economic justification in the money saved or earned.

"For a number of reasons, this is a favorable time to undertake needed public works. The community can 'eat its cake and have it, too.' Bonds of financially stable communities are selling at par or even at a premium. Many other high class municipal bonds are selling at small discounts. On the other hand, construction costs are off materially. The average cost of paved highways is between 20 and 30% under that of 1930. Building costs have dropped as much. Even if bonds must be sold on a 6% basis, the ultimate cost of the work to the public would be a bargain compared with the costs of work for a decade prior to 1929.

"As to the nature of wise public investment, be it noted that American cities are using thousands of miles of wornout pavements, uneconomical to maintain and costly to users. There are 247 cities of over 1000 population in the United States which have no sewage collection systems whatsoever and almost 6000 which have no disposal plants. And these conditions continue in the face of constant protest from state and municipal boards of health.

"Business leaders and public officials have come to see the function of public works in speeding up the business machinery," the letter concluded, "which is added reason for keeping in mind the distinction between current expenditures and wise capital investment."

Builds Crushing Plant in California

IN ORDER to meet the demand for rock and sand to the Pasadena dam when concrete construction begins, the Consolidated Rock Products Co. is constructing a new unit on the site of the Puente Largo plant near Azusa, Calif., the *Azusa Herald* reports.

The new plant, which will probably cost around $100,000, will have capacity of approximately 3500 tons per day.

The Consolidated company will deliver the rock and sand over the county railroad to the mouth of the canyon, where the material will be picked up by an aerial tramway and transported three miles to the site of the dam.

The old crushing plant on the Puente Largo site has been completely dismantled.

All machinery and equipment in the plant is new, Glen Moore, superintendent, reports.

Opens Gravel Pit in Texas

A NEW ENTERPRISE to be known as the Three Rivers Sand and Gravel Co. has been organized in Three Rivers, Tex. The gravel pit furnishing the sand is situated on the D. Mahoney land west of the Frio river. A gravel washer has been installed.

The new plant is to be managed by M. Hayes of Missouri. This company has recently established a plant in Bell county.—*Three Rivers* (Tex.) *News.*

THE INDUSTRY

Incorporations

Consumers Fuel Co., Muskegon, Mich., $50,000. Fuels and gravel.

Kerr Granite and Marble Co., Inc., Staunton, Va., $15,000. Robert W. Kerr.

James River Hydrate and Supply Co., Indian Rock, Va., $200,000. L. P. Dillon.

Fairground Sand and Gravel Co., Huntington Station, N. Y., 100 shares common. Partridge and Sullivan, Northport, N. Y.

Valley Sand and Gravel Co., Davenport, Iowa, $10,000. B. H. Kelly, president, and Wilfred W. Behm, secretary and treasurer.

Royal Quarrying and Manufacturing Corp., Elberton, Ga. Jose Canales, Elberton, and H. I. Molitch and E. J. Gomez of Philadelphia.

Kalo Brick and Tile Co., Fort Dodge, Iowa, $100,000. President, George Schnurr; vice-president, Will Schnurr; secretary-treasurer, G. E. Schnurr.

Hoosier Limestone Corp., Bloomington, Ind., 2500 shares at $100. William H. Johnson, John Edgeworth, Philip C. Furst, J. G. Ray, J. L. Torphy and B. G. Hoadley. To operate stone quarries.

Northwestern Co., Grand Rapids, Mich., 350.000 shares no par value. Succeeds Northwestern Sand and Gravel Co. of Charlevoix. President, John Roen. Charlevoix; vice-president and general manager, Ira J. Lyons, Grand Rapids; treasurer, John Purves, and secretary, E. E. Holsinger, both of Sturgeon Bay, Wis.

Quarries

Quarry Products Co., Appleton, Wis., recently offered 10,000 sq. ft. of sod to a local cemetery for 2½c. per sq. ft.

York Stone and Supply Co., York, Penn., recently had three of its pump houses damaged in a fire at its quarry.

Columbus Junction, Ia. The county is preparing to move its crusher here soon from its present location near Wapello.

Oxford Junction, Ia. A rock crusher has been placed in the Anamosa quarry north of here and will start operation soon.

Dalton, Ga. The state has located a crusher and a small crew of convicts near Cedar Ridge where they will prepare stone for road work.

Essex Trap Rock Co., Peabody, Mass., plans to rebuild that part of crushing plant recently damaged by fire. New equipment will be installed.

Michigan Limestone and Chemical Co. is reported to have made its first shipment of the season of crushed stone by water from its plant at Calcite, Mich., on the Str. *B. H. Taylor*, July 12.

W. A. Grant Co., Cave-in-Rock, Ill., has ceased operations and is going out of business because of failing health of the owner, W. A. Grant. The plant is being dismantled and Glenard Grant, son of the owner, is in charge of selling the machinery and equipment. The quarry, which is on the shore of the Ohio river, formerly produced rip rap and Agstone.

Sand and Gravel

Cook and McCoy Construction Co. has leased a gravel pit near Goff, Kan.

Moose Lake Sand and Gravel Co., Moose Lake, Minn., recently had its switchboard damaged by fire during an electrical storm.

Washington, Mo. Some difficulty has recently been experienced by gravel producers along the Missouri river because of the high water.

Wm. Reckling recently discovered a sand and gravel deposit on his farm near Comstock, Neb. The extent of the deposit has not been determined.

Neal Gravel Co., Mattoon, Ill., is reported to have been doing a good business this year by the *Mattoon Gazette*. A description of the company's operation was also given.

Empire Sand and Material Co., Fort Dodge, Ia., and its benefits as a local institution to the community, was recently featured in a news story of the *Fort Dodge Messenger-Chronicle*. A description of its operation was given.

Cement

Monarch Cement Co., Humboldt, Kan., has increased operations at its plant there.

Alpha Portland Cement Co. plans to resume operation of its Cementon, N. Y., plant August 1.

Century Cement Corp., Rosendale, N. Y., manufacturer of masonry cement, was declared bankrupt by the U. S. District Court on July 15.

Marquette Cement Manufacturing Co., Chicago, Ill., has received an order for 500,000 bbl. of cement to be used in the construction of Mississippi waterway projects.

Aetna Portland Cement Co., Detroit, Mich., recently made its first shipment of bulk cement for the season to the upper peninsula of Michigan in its boat, the *Oscar J. Lingeman*.

Southwestern Portland Cement Co. has reopened its Osborn, Ohio, plant and will operate at 50% of capacity. The El Paso, Tex., plant has been closed. Shipments will be made from stock.

Leningrad, U. S. S. R. Among the cement plants completed during the first half of 1932 were those at Kuvassyisk, Novo-Amvrosievsk, Voronezh and Kharkov with a total annual capacity of over 3,000,000 bbl.

Metropolitan Cement Corp. has completed plans for extensions and improvements to the recently acquired plant of Building Materials Corp., Raritan township, New Jersey, which it will convert into a cement plant. Cost of alterations is reported as $500,000, including machinery.

Lime

Illmo Lime Co., Illmo, Mo., has ceased operations after doing considerable preliminary work and exploration. The company was organized by F. G. Perry but had not yet built a plant at the time it stopped operating.

Cement Products

Art Stone and Tile Co., Wilmington, Del., is observing its 18th anniversary.

Cast Stone Products, Inc., Houston, Tex., is building a plant at 1601 Oliver St. to manufacture concrete building units of a new design.

Other Rock Products

Standard Slag Co., Jackson, Ohio, is reported to be operating overtime with a full force of employes.

American Black Granite Co., Ashland, Wis., has purchased approximately 800 acres of land near Grandview believed to contain marble.

Magnesium Properties Co. is constructing a refinery for magnesium salts near Medicine Bow, Wash. It is expected the plant will be in operation early in September.

Marshall, N. C. The Lewis mine on Big Laurel is the only talc mine now being operated in Madison county. It has been opened to a depth of about 90 ft. and is said to be a very high grade of talc.

Personals

Ellis F. Rucker, for several years Missouri sales manager for the Missouri Portland Cement Co., is starting a lumber company at Jefferson City, Mo.

Walter A. Wecker, secretary and treasurer, Marquette Cement Manufacturing Co., Chicago, has been elected a vice-president of the company.

Willis Laughery recently was injured when a rock fell from a truck of the Hufty Rock Asphalt Co., near Liberal, Mo., which he was helping push up a steep grade.

E. M. Underwood has joined the combustion engineering department of the Patterson Foundry and Machine Co. and will make his headquarters at East Liverpool, Ohio.

Dock Brown, a worker at the Caruthers and Crouch rock quarry near Mill Grove, recently was injured when he was struck by a large rock which fell from the face of the quarry.

J. C. McQuiston, former advertising manager of Westinghouse Electric and Manufacturing Co., has been appointed manager-secretary of American Gear Manufacturers Association, Wilkinsburg, Penn.

H. P. Caldwell, Jr., whose father is secretary of the Ohio River Sand Co., was recently attacked by a grizzly bear while vacationing in Yellowstone National Park. His shoulder was badly mangled as a result.

Fred E. Swineford, engineer of the Ohio Crushed Stone Association, recently discussed the merits of crushed stone and bituminous products for secondary road construction at a meeting of county representatives at Twin Lakes, Ohio.

William H. Hoagland, president of the Marble Cliff Quarries Co., and **Harold J. Kaufman**, president of the Arrow Sand and Gravel Co., each was recently featured in the *Columbus* (Ohio) *Citizen* in a department of the paper, "Columbus Presidents and Their Associates."

L. B. Yourtee, general manager of Yourtee-Roberts Sand Co., Chester, Ill., dived into the Mississippi river near where the company's dredge was operating and pulled out two boys caught in an eddy from which they could not get out. The boys were exhausted when taken from the river and could not have held out much longer. The rescue occurred on July 7.

Obituaries

Albert C. Manis, 59, master mechanic of the Ironton plant of the Alpha Portland Cement Co., died July 10 of a heart attack.

Samuel Milliken, 64, of North Fairfield, Ohio, was suffocated in a gravel pit near Norwalk when a slide of gravel fell on him. Other workers escaped.

Manufacturers

Columbus-McKinnon Chain Corp. announces removal of its fire welding operations from Columbus, Ohio, to Tonawanda, N. Y.

Combustion Engineering Corp., New York, N. Y., is furnishing two additional steam generator units for a triangle heating plant to the United States Treasury Department.

Worthington Pump and Machinery Corp., Harrison, N. J., announces the transfer and consolidation of the designing and engineering activities formerly carried at its Cincinnati, Ohio, works to the Buffalo, N. Y., plant.

Hendrick Manufacturing Co., Carbondale, Penn., announces the appointment of R. F. Baldwin as sales representative in the Philadelphia district. His territory will include southeastern Pennsylvania, southern New Jersey and the states of Delaware and Virginia.

G. L. Harman

Keystone Driller Co., Beaver Falls, Penn., announces appointment of G. L. Harman as general sales manager. It also announces appointment of Lynn H. Ransom as chief engineer. Mr. Harman was formerly sales manager of the Industrial Brownhoist Corp.

Kron Co., Bridgeport, Conn., announces appointment of the following representatives: Industrial and Commercial Scale Co., Charlotte, N. C.; J. Kirk Rowell, Louisville, Ky.; and Williams, Cole and Wolff, Inc., Milwaukee, Wis.

Babcock and Wilcox Co., New York, N. Y., has been awarded a large contract by the Department of the Interior for fabrication and installation of welded plate steel outlet pipes for the hydraulic power and flood control tunnels at Hoover Dam. A complete fabricating plant will be built at the site of the work to supply this installation.

Worthington Pump and Machinery Corp., Harrison, N. J., is conducting a tour of the country with a specially built demonstration unit with a portable compressor, rock drills, pavement breakers and other air powered equipment. The entire assembly is mounted on a Studebaker truck chassis. The tour will continue through the summer and fall.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Trucks. Folder describes construction and gives specifications of FWD model LBU trucks. FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

Crushers. Folder describes advantages of "Gyro-Centric" crushers. THE PATTERSON FOUNDRY AND MACHINE CO., East Liverpool, Ohio.

Welding Rods. Specification sheet gives detailed information on Amsco nickel manganese steel welding rods. AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill.

Arc Welders. GEA-1477 describes characteristics of the new G-E arc welders, types WD-21, WD-22, WD-23 and 24. Dimensions of the equipment are included. GENERAL ELECTRIC CO., Schenectady, N. Y.

Classified Directory of Advertisers in this Issue of Rock Products

For alphabetical index, see page 64

This classified directory of advertisers in this issue is published as an aid to the reader. Every care is taken to make it accurate, but ROCK PRODUCTS assumes no responsibility for errors or omissions. The publishers will appreciate receiving notice of omissions or errors, or suggestions

Acetylene Welding Rod
Haynes Stellite Co.

Agitators, Thickeners and Slurry Mixers
Hardinge Company.
F. L. Smidth & Co.

Air Compressors
Fuller Co.
Nordberg Mfg. Co.

Air Filters
Fuller Co.

Air Separators
Bradley Pulverizer Co.
Hardinge Company.
W. W. Sly Mfg. Co.

Alloys (Metal)
Haynes Stellite Co.

Automatic Weighers
Merrick Scale Mfg. Co.

Babbitt Metal
Joseph T. Ryerson & Son, Inc.

Backfillers
Bucyrus-Erie Company

Balls (Grinding)
Lorain Steel Co.

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Lorain Steel Co.
F. L. Smidth & Co.

Bearings
Haynes Stellite Co.

Belting (Conveyor and Elevator
Goodyear Tire & Rubber Co., Inc.

Belting (Multiple V)
Goodyear Tire & Rubber Co., Inc.

Bin Gates
Fuller Co.

Blast Hole Drills (See Drills, Blast Hole)

Breakers (Primary)
Smith Eng. Wks.

Buckets (Dragline and Slackline)
Bucyrus-Erie Co.

Buckets (Elevator and Conveyor)
Cross Engineering Co.
The Hayward Company
Hendrick Mfg. Co.

Buckets (Grab, Clamshell, etc.)
The Hayward Co.

Cableways
Broderick & Bascom Rope Co.
The Hayward Company

Cap Crimpers and Fuse Cutters
Ensign-Bickford Co.

Cars (Dump)
Lorain Steel Co.

Cars (Quarry and Gravel Pit)
Easton Car & Construction Co.
Lorain Steel Co.

Castings
Haynes Stellite Co.

Cement Making Machinery
F. L. Smidth & Co.

Cement Pumps
Fuller Co.
F. L. Smidth & Co.

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.

Chain Systems (Kilns)
F. L. Smidth & Co.

Chute or Launder Lining
Goodyear Tire & Rubber Co., Inc.

Chutes and Chute Liners
Cross Engineering Co.

Clamshell Buckets (See Buckets, Grab, Clamshell, etc.)

Clips (Wire Rope)
Broderick & Bascom Rope Co.

Coal Pulverizing Equipment
Bradley Pulverizer Co.
Hardinge Company
Pennsylvania Crusher Co.
F. L. Smidth & Co.

Compressors (See Air Compressors)

Conveyors and Elevators
Fuller Company
The Hayward Company
F. L. Smidth & Co.
Smith Engineering Works

Conveyors (Pneumatic)
Fuller Company

Coolers (See Kilns and Coolers, Rotary)

Correcting Basins
F. L. Smidth & Co.

Cranes, Caterpillar (See Cranes, Crawler and Locomotive)

Cranes (Clamshell)
Bucyrus-Erie Co.

Cranes (Crawler and Locomotive)
Bucyrus-Erie Co.
Harnischfeger Corp.

Cranes (Gantry)
The Hayward Co.

Cranes (Overhead, Traveling, Electric)
Harnischfeger Corp.

Crushers (Hammer)
Lorain Steel Co.
Pennsylvania Crusher Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.
Smith Engineering Works

Crushers (Single Roll)
McLanahan & Stone Corp.
Pennsylvania Crusher Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.

Diesel Engines (See Engines, Diesel)

Dipper Teeth
The Frog, Switch & Mfg. Co.

Dippers and Teeth (Steam Shovel)
Bucyrus-Erie Co.

Ditchers
Bucyrus-Erie Co.

Draglines
Bucyrus-Erie Co.
Harnischfeger Corp.

Dragline Excavators
Bucyrus-Erie Co.
The Hayward Co.

Dragline Cableway Excavators
Bucyrus-Erie Co.

Dragline Excavators (Walking)
Bucyrus-Monighan Company

Dredge Chain (See Chain)

Dredges
Bucyrus-Erie Co.
The Hayward Company
Morris Machine Works

Drilling Accessories
Loomis Machine Co.

Drills (Blast Hole)
Loomis Machine Co.

Drills (Well) (See Drills, Blast-Hole)

Drives (Short Center)
Allis-Chalmers Mfg. Co.

Dryers
Allis-Chalmers Mfg. Co.
Ruggles-Coles Div. of Hardinge Co.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
W. W. Sly Mfg. Co.

Dust Conveying Systems
Fuller Co.

Electric Mine Hoists
Nordberg Mfg. Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.

Elevators (See Conveyors and Elevators)

Engineers
F. L. Smidth & Co.

Engines (Diesel)
Nordberg Mfg. Co.

Engines (Steam)
Morris Machine Works

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Feeders
Fuller Co. (Cement and Pulverized Material)
Smith Engineering Works (Plate)

Feeders (Weighing)
Schaffer Poidometer Co.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Gaskets
Goodyear Tire & Rubber Co., Inc.

Gates, Bin (See Bin Gates)

Grab Buckets (See Buckets, Grab, Clamshell, etc.)

Grizzlies
Smith Engineering Works

Hammer Mills (See Crushers)

Hard Facing Materials
Haynes Stellite Co.

Hascrome
Haynes Stellite Co.

Hastelloy
Haynes Stellite Co.

Hoists
The Hayward Co. (Steam, Gasoline & Electric)

Hose (Water, Steam, Air Drill, Suction)
Goodyear Tire & Rubber Co., Inc.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Hardinge Company
F. L. Smidth & Co.

Kominuters (See Mills)

Lighters (Hot Wire—For Safety Fuse)
Ensign-Bickford Co.

Lime Handling Equipment
Fuller Co.

Linings (Iron for Ball and Tube Mills) (See Mill Liners)

Loaders and Unloaders
Bucyrus-Erie Co.

Locomotive Cranes (See Cranes, Crawler & Locomotive)

Locomotives (Diesel)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Diesel-Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Gas Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Oil-Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Steam, Gas and Electric)
Fate-Root-Heath Co. (Gas)
Plymouth Locomotive Wks (Gas)

Log Washer
McLanahan & Stone Corp.
Smith Eng. Wks.

Lubricants
Broderick & Bascom Rope Co. (Wire Rope)

Machine Parts
Haynes Stellite Co.

Machinery Guards
Harrington & King Perforating Co.

Manganese Steel Castings
The Frog, Switch & Mfg. Co.

Metals (Acid and Corrosion Resistant)
Haynes Stellite Co.

Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
Bradley Pulverizer Co.
Hardinge Co.
F. L. Smidth & Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Lorain Steel Co.
F. L. Smidth & Co.

Molds (Concrete Pipe)
Universal Concrete Pipe Co.

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.

Packings
Goodyear Tire & Rubber Co., Inc.

Perforated Metal
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

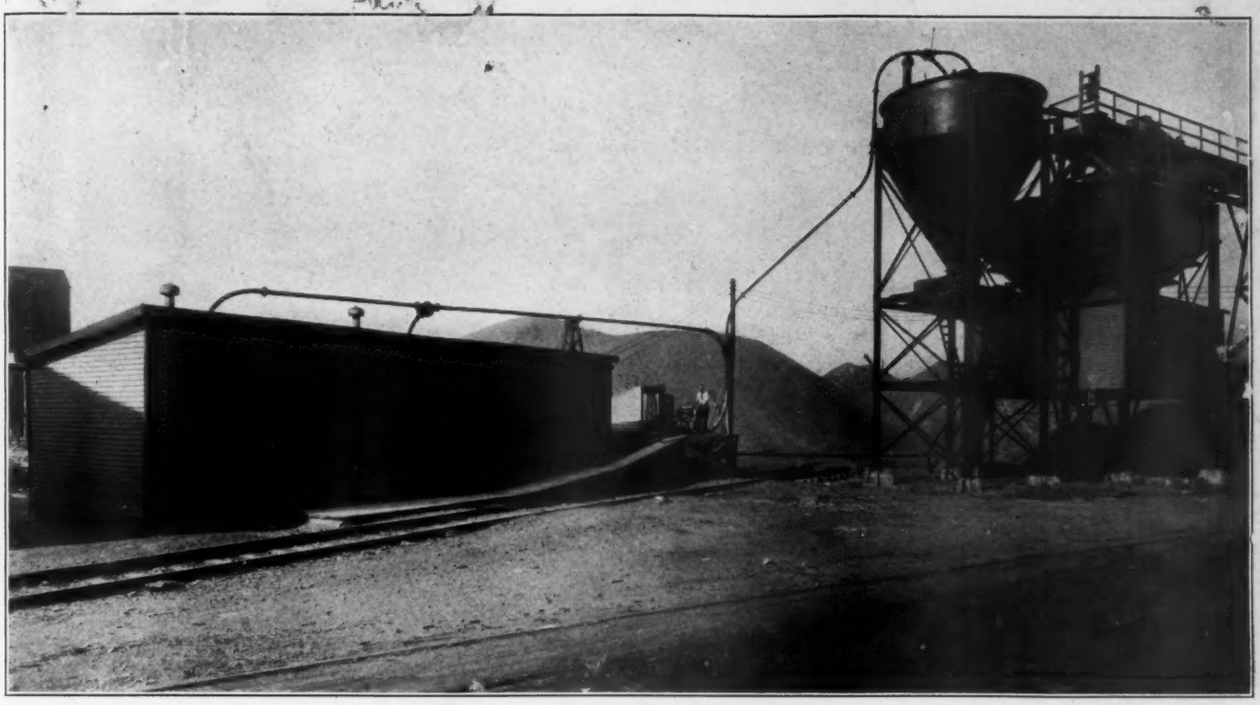
Pipe Machines (Concrete)
Universal Concrete Pipe Co.

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Fuller Company

Portable Crushing and Screening Unit
Smith Eng. Wks.

WAREHOUSES FOR BULK CEMENT



The portable Fuller-Kinyon Pump, shown on the car unloading platform, unloads box cars and conveys to either of two compartments in the batcher bin, the surplus being diverted to either of two rooms in the warehouse. To recover cement from storage, the pump is moved down the ramp, under its own power, into either one of the storerooms

The Type "B" portable Fuller-Kinyon Pump is available in a full range of capacities to meet all commercial requirements. This machine is self-propelled. Stationary pumps are also furnished for unloading hopper-bottom cars, L.C.L. containers and for conveying from box cars where electric current is not available.

LOWER PLANT AND PRODUCTION COSTS

can be realized if full advantage is taken of the plant layout possibilities made available by Fuller-Kinyon Systems. By avoiding interference with other plant operations in the handling and storage of bulk cement, permanent economies are effected. Simplification of plant design reduces initial costs. The unique ability of the portable Fuller-Kinyon Pump to recover cement from a floor makes it possible to avoid the expense of bin or silo storage, by the use of warehouses of the type illustrated. Large storage space is thus available at low cost and different cements may be stored and handled without delay or contamination.

A bulletin, just off the press, illustrates a large number of interesting plants adapted to various local conditions and designed for low production costs.

Fuller Company
CATASAUQUA, PENNA., U. S. A.

CEMENT WEIGHING BATCHERS
PNEUMATIC CONVEYORS
COMPRESSORS

STATIONARY and PORTABLE **FULLER-KINYON** ***CONVEYING SYSTEMS***

Recognized the World Over as the Leader in Its Field

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

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